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The Physiotherapy Review

Volume 16 Number 2

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Some Problems in Muscle Disorder

Herman Chor, M. D.

The many services rendered by the physical therapist bring him in close association with the various specialties in medical and surgical practice. The neurologist frequently asks for assistance, particularly in the treatment of paralyses and other muscle disorders. The recent epidemics of poliomyelitis have emphasized the importance of this service. The problems of prevention of atrophy and deformity and of restoration of function have been receiving more and more attention and study. In peripheral nerve lesions due to trauma or infection, similar problems are presented. Not infrequently also the physical therapist is called upon to treat a spastic type of paralysis such as occurs in the hemiplegias due to cerebral vascular accidents, the so called "stroke," or in the spastic palsies of childhood. In addition, there are a variety of neurologic syndromes resulting from lesions of the nervous system involving the motor pathways, either in the brain or spinal cord, which result in a disturbance of the body musculature.

Figure 1 is a diagram in which such lesions are represented. Emphasis is placed upon three groups of muscle disorders: first, the upper motor neuron type, characterized by a spastic paralysis, exaggerated reflexes and little or moderate wasting; second, the lower motor neuron type, with flaccid paralysis, diminished or absent reflexes and marked atrophy; and thirdly, the myopathies, or primary muscle disorders. In this last group may be mentioned so called muscular dystrophies, myasthenia gravis, amyotonia congenita (Oppenheim's), myotonia congenita (Thomsen's), and other syndromes which occur frequently enough to call attention to the fact that our knowledge of them is extremely vague and inadequate.

The problems in therapy presented by these muscle disorders are of paramount interest to the physical therapist. That there exists differences of opinion as to the type of physical therapy to be employed in the treatment of paralyses is indicative of the need for a better understanding of the problem. The use of electrical stimulation, massage, heat and passive movements has been modified chiefly as a result of clinical experience. More recently the principles of rest and reeducation have been emphasized. It appears that many discrepancies in the results of these therapeutic measures are due to differences in the type and severity of the muscle disorder under treatment. A primary muscle disease, such as pseudohypertrophic muscular dystrophy, presents a problem in treatment quite different from that of an anterior horn cell or peripheral nerve type of paralysis. It appears that a more rational therapy will be forthcoming through a better understanding of the tissue and organ being dealt with, namely skeletal muscle, and of the changes which occur in this tissue under pathologic conditions.

From the department of Nervous and Mental Diseases, Northwestern University Medical School.

The experimental work referred to has been carried out with the assistance of a grant from the Council on Physical Therapy of the American Medical Association.

Structure of Skeletal Muscle

We must distinguish between muscle as an organ and muscle as a tissue. A muscle as an organ is composed of an aggregation of several tissues of which the muscular is the most abundant and characteristic. Besides muscular tissue it has connective tissue to web it together, nerves to stimulate it and blood vessels to nourish it.

A typical voluntary muscle is composed of tens of thousands of muscle fibers arranged more or less side by side in fascicles or bundles. These muscle fibers are attached by one end to the tendon through which they pull. At the other end they are attached to bone either directly or indirectly by tendinous bands. A fascicle is composed of a multitude of cylindrical fibers which are transversely striated, each muscle fiber representing a union of several cells and possessing a number of nuclei. A muscle cell consists of a group of thread-like fibrils called sarcostyles, imbedded in a matrix, the sarcoplasm, and is surrounded by a semi-permeable membrane, the sarcolemma, under which are located the muscle nuclei.

The characteristic feature of voluntary muscle tissue is the cross striation of its fibers. This striation results from the fact that each myofibril or sarcostyle is not homogeneous but consists of alternating dark and light discs or segments (Fig. 2), The corresponding discs of adjacent fibrils are usually arranged at the same level in the fiber and cause the regular transverse striated appearance of the fibers. These myofibrils lie in the sarcoplasm in compact bundles or columns (Kolliker) of various thicknesses. Between the columns are spaces of varying width occupied by sarcoplasm.

The myofibril along its entire length is subdivided into a number of short, cylindrical similar sections which are metamerically arranged and each of which possesses a rather complicated structure (Fig. 2). These segments or sarcomeres have been considered to be anatomical and functional muscular units. Many of the theories of muscular contraction are built upon them as the simplest units of the muscle.

In cross section of a muscle fiber the fibrils appear as fine dots. The grouping of the fibers into bundles gives, on cross section, an appearance of distinct areas called Connheim's zones. Between these zones is distributed the matrix or sarcoplasm. The myofibril is the contractile element of the muscle fiber, whereas the sarcoplasm, although thought to have some contractile

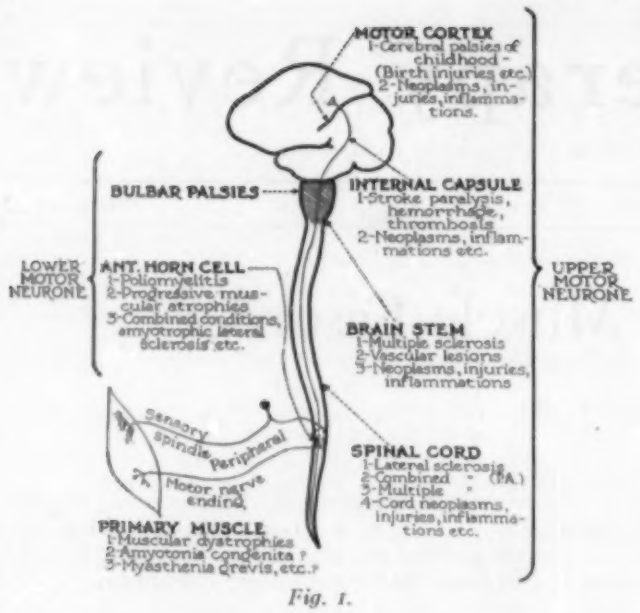


Fig. 1.

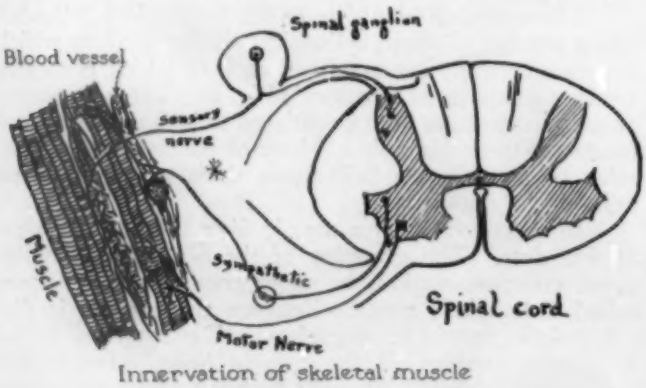
property, is primarily concerned with the nutrition of the fibrils.

INNERVATION OF STRIATED MUSCLE (FIG. 3)

The somatic motor innervation of striated muscle has been well established. The exact nature of the intramuscular nerves, however, particularly their endings, is not common knowledge, except among histologists and those engaged in special study on muscle.

The intramuscular motor nerves originate from neurons, the cell bodies of which are located in the ventral horns of the spinal cord and medulla. The axons of these cells leave the cerebrospinal axis as medullated fibers which, after profuse splitting, enter the muscle fibers. Each motor neuron innervates on the average more than one hundred muscle fibers. Upon entrance into the muscle the medullary sheath of the nerve fuses with the sarcolemma of the muscle fiber allowing the naked axis cylinder to enter the muscle fiber substance. In doing so this axon ramifies, giving rise to the so called telodendron or end-brush, so characteristic of the motor nerve endings (Fig. 4). This ramification may be elaborate with the participation of numerous neurofibrils with their finer twigs or it may be very simple, with the formation of a "claw-like" structure.

Along these terminal twigs are various knob-like expansions and in many instances the finest neurofibrils terminate in little end-loops or ringlets. This so called end-brush with the aforementioned terminal buds and loops, lies imbedded in a layer of granular protoplasm which is collected in a small mass where the nerve penetrates the sarcolemma. In this protoplasm are numerous vesicular nuclei. This structure, the "sole," forms a more or less distinct elevation on the side of the muscle fiber discovered many years ago by Doyere and hence called Doyere's elevation. Thus the so called motor endplate is composed of two main parts: (1) the ramification of the axis cylinder and (2) the granular sole plate with its nuclei.



Innervation of skeletal muscle

Fig. 3.

According to Boeke[1] there exists, extending from the finest twigs of the telodendron neurofibrils, a very fine and more or less granular reticulum, which may be followed through the granular sole plate, and which finally passes into the anisotrophic discs of the myofibril where it forms a delicate network throughout the whole thickness of the disc. This has been designated the "perterminal network."

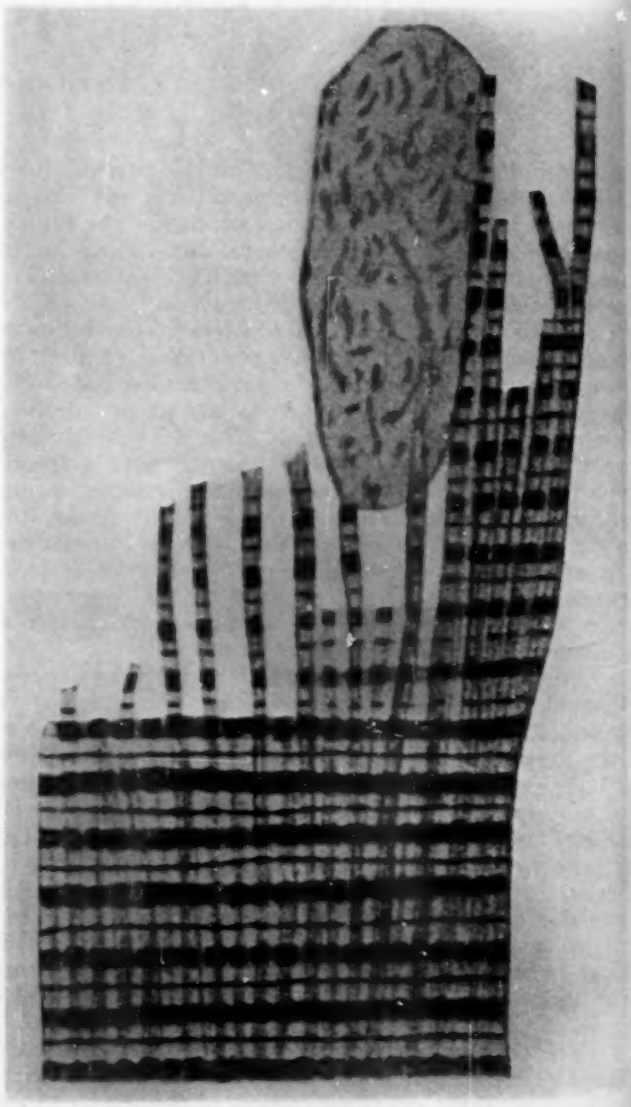


Fig. 2. Diagrammatic Sketch of Striated Muscle Fiber (Maximow). Parallel arrangement of myofibrils in the cell gives rise to striated appearance of muscle fiber. Large vesicular nucleus under cell membrane (Sarcolemma).

The motor nerve ending and its characteristic endplate has been very much neglected particularly in the studies of muscle pathology. This has been due, no doubt, to the difficulty in obtaining satisfactory staining by former methods. That nerve endings may be accurately studied, however, has been shown in a previous study on the nerve ending changes in poliomyelitis.[2]

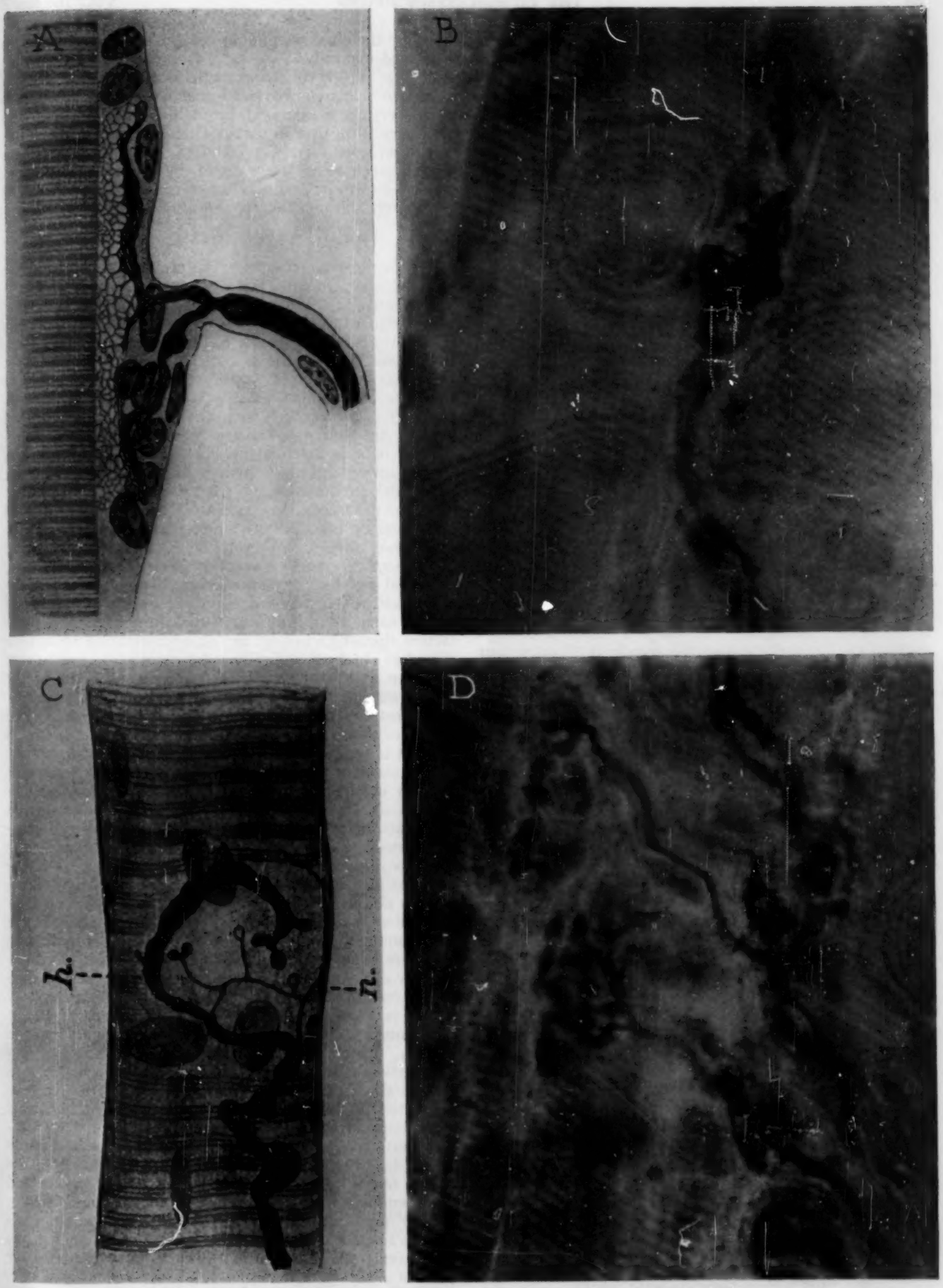


Fig. 4. Motor Nerve Endings in Striated Muscle. A (diagram (Boeke)) and B (photomicrograph)—Lateral view of motor end-plate showing a single nerve filament entering the striated muscle fiber and forming an elaborate end-brush or telodendrion. This lies embedded in a layer of granular protoplasm containing numerous vesicular nuclei—the "sole"—which forms an elevation on the side of the muscle fiber called Doyer's elevation. (Monkey muscle—magnification x 1800) C Diagram (Boeke) and D (photomicrograph). Ramification of axon on the sole plate of the muscle fiber. The neurofibrillar twigs end in knoblike expansions or end-loops. Vesicular nuclei of the sole can be seen under the neurofibrillar twigs. (Monkey muscle—magnification x 1800).

The sensory innervation of striated muscle is somewhat more complicated. Of prime importance is the chief sensory ending, the neuromuscular spindle, from which the stretch reflex is initiated. This special end-organ is composed of a group of from five to ten special muscle fibers, the intrafusal fibers of Weisman, surrounded by a fibrous tissue capsule in such a manner as to give rise to a fusiform or spindle-shaped structure (Fig. 5). There are several of these spindles in a muscle bundle. The muscle fibers within the spindle are striated, but differ from those of the bulk of the muscle, the so called extrafusal fibers, in certain features. The intrafusal fibers are narrower and in some regions show muscle nuclei in a central position rather than directly under the sarcolemma. Furthermore, in the middle portion of the spindle, the fibers are richly nucleated, in some instances the abundance of nuclei obscuring the transverse striations of the fibers. This portion of the spindle has been designated the equatorial region. The parts of the bundle proximal and distal to this middle portion have been designated the proximal and distal polar regions, respectively. According to Sherrington,[3] these narrow intrafusal fibers are formed by division of parent fibers of the extrafusal type. Each parent fiber passing into the capsule gives rise to two or three daughter fibers. The intrafusal fibers are surrounded by a fine connective tissue sheath, named by Sherrington the "axial sheath." Between this sheath and the fibrous tissue capsule is a space which contains a fluid, supposedly lymph.

The capsule is a lamellated connective tissue sheath which is continuous with the connective tissue perimysium of the muscle. Where the spindle is situated near the tendon of the muscle, the distal end of the capsule may become continuous with the connective tissue of the tendon.

The spindle receives both sensory and motor nerves. The nerve fibers are generally large and heavily medullated. Hinsey[4] noted from two to four nerves in the smaller spindles and more in the larger ones. The most prominent sensory nerve penetrates the capsule and winds itself in a charasteristic spiral manner around the intrafusal fibers forming the primary ending, the annulospiral organ of Ruffini. From this spiral there are given off many secondary ramifications which are applied in an epilemmal position on each of the muscle fibers. The terminations are in the form of buds or leaves giving rise to the elaborate and characteristic flower-wreath appearance. The distribution of this sensory nerve ending occurs at the equatorial portion of the spindle. In the polar regions, both proximal and distal, another type of nerve ending is found—distinctly of the motor end-plate variety. Tower[5] has shown conclusively that these endings originate from motor cells of the anterior horns. Some investigators have reported nonmedullated or fine fibers coursing in the spindles and have thought them sympathetic in character. This is controversial. Blood vessels are distributed among the intrafusal fibers and may show fine, nonmedullated nerve fibers which are of sympathetic origin.

The muscle spindle is considered a receptor, which informs the central nervous system of changes in the state of the muscles. Its delicate structure makes it particularly irritable to stimuli; contractions of the intrafusal muscle fibers or any change in shape readily stimulates the closely applied nerve endings through which the message is transmitted centrally. Pathologic changes in the neuromuscular spindle have been described in experimentally produced lesions of the posterior ganglion neurons or their axons, and in certain muscular affections observed clinically.

The subject of sympathetic innervation of skeletal muscle is still a controversial one. Nonmedullated fibers have been seen coursing through striated muscle, but that they form definite endings on the muscle fibers has not been conclusively established. Sympathetic fibers may be seen along the walls of the intramuscular blood vessels, however, and may exercise some role in muscle physiology through this influence upon the circulation.

TROPHIC STATE OF SKELETAL MUSCLE

What are the changes which occur in skeletal muscle in paralyses, atrophies, and dystrophies? Before attempting to answer this question it is well to consider our knowledge of the so called "trophic state" of muscle. This term is often referred to throughout medical literature, usually with the acknowledgment that its exact definition is still quite vague. In general, it applies to the state of health of a tissue. For normal physiologic function it is necessary that the physical and chemical constituents of a specific tissue be maintained in a more or less definite relationship. The exact nature of the factors influencing the nutrition of muscle, however, are still poorly understood.

The most common concept of "trophic state" assigns a neurogenic basis for its maintenance. In addition to the nerve supply, however, other factors, principally blood supply, specific nutritional elements, (vitamins, etc.) and activity (physiologic functioning) deserve consideration. A better understanding of the effects upon muscle tissue resulting from disturbances in each of these factors should be helpful in the interpretation of muscle disorders observed clinically. A program of experiments has been undertaken with this purpose and some of the results may be included in this discussion.

Inactivity of skeletal musculature over a prolonged period of time results in wasting of those muscles not in use. It is well known, however, that a return to activity brings about a prompt increase of the affected muscles to their original bulk. The term "disuse atrophy" has been used indiscriminately in referring to muscle shrinkage which occurs in various types of lesions of the nervous system. Likewise in local atrophies associated with arthritis in which activity is limited, the factor of disuse has been stressed. This concept of disuse atrophy, however, is not strictly correct and needs to be clarified.

Other than in immobilization, as for example, in the treatment of bone fractures and in hysterical paralysis, there are very few conditions which give rise to simple atrophy of disuse. Recent experiments have helped clarify the nature of this type of atrophy.[6] Disuse atrophy occurs very slowly. As such, it differs greatly from the rapid muscle atrophy resulting from lower motor neuron lesions. Histologic studies have established the fact that simple disuse atrophy is associated with very simple structural changes. The loss in muscle bulk can be accounted for on the basis of a diminished quantity of sarcoplasm in the individual muscle fibers. The atrophied muscle fibers are narrower and are packed more closely together. There is no actual degeneration of the muscle fibers, however, and the intramuscular nerves and nerve endings remain intact and of normal appearance. The intramuscular blood vessels likewise remain unaltered. There are no features indicating an attempt at regeneration, such as an increase in muscle nuclei or mitosis.

The muscle atrophy which occurs following nerve section is more than a wasting due to disuse. It is very rapid in its course and characteristic histologic changes

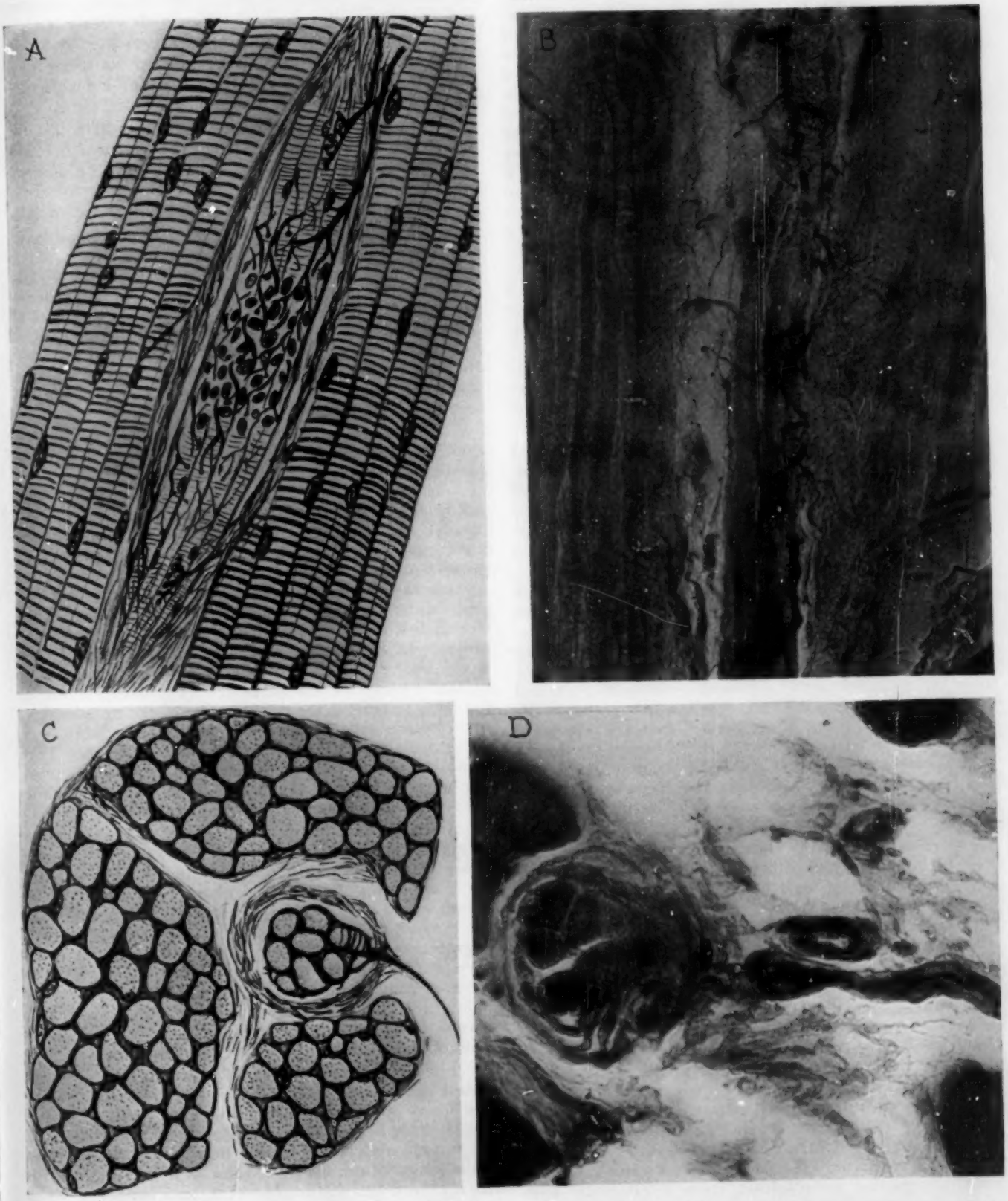


Fig. 5. Sensory Neuro-Muscular Spindle in Striated Muscle. A (diagrammatic sketch) and B (photomicrograph) showing longitudinal section through muscle spindle. Fusiform bundle of muscle fibers (Weisman) along which may be seen the chief sensory nerve winding in a spiral manner—the annulo-spiral organ of Ruffini. From this spiral there are given off many secondary ramifications with bud or leaf-like terminations. (Human-fetal) Magnification x 560. C (diagrammatic sketch) and D (photomicrograph) showing cross-section of neuro-muscular bundle. Heavily myelinated nerve may be seen penetrating the capsule of the spindle, to be distributed along the intrafusal muscle fibers. (Human-fetal) Magnification x 650.

can be observed quite clearly. In addition to the shrinkage of the muscle fibers, degeneration of these cells occurs. The cross striations disappear and a molecular and vacuolar breakdown of the muscle cells follows. In later stages the disintegrated muscle cells are replaced by fat and fibrous tissue. A striking feature of this type of atrophy is the marked increase in sarcolemmal and muscle nuclei which takes place quite early, before the degeneration of the muscle fibers. These features are not observed in simple disuse atrophy. Furthermore, a critical feature of nerve section atrophy is the alteration in the intramuscular nerve endings. Both motor endplates and sensory spindles show changes characteristic of wallerian degeneration. After one week of denervation there are few nerve endings to be seen. This is in marked contrast to what is found in simple disuse atrophy, even of very long standing, in which the nerve endings remain intact. Of some significance also is the reaction of the intramuscular blood vessels in nerve section atrophy. Capillary dilatation, endothelial hypertrophy, and eventually fibrosis can be clearly demonstrated. In simple disuse atrophy the blood vessels remain normal.

The studies of Tower[7] have shown that the posterior roots have little to do with the maintenance of the trophic state of skeletal muscle. Destruction of this portion of the nerve supply leads to degeneration in the muscle spindles, particularly the equatorial portion. The chief bulk of the muscle is not affected, however, except for slight atrophy due to lessened activity.

The ventral root component is the chief neurogenic trophic element. The early recognition of this fact led to the emphasis of the anterior horn cells as the chief trophic center, with a result that other factors have not received adequate attention. The relation of the anterior horn cell to muscle atrophy is seen clinically in acute and chronic poliomyelitis. The changes which occur in the muscles involved are quite similar to those discussed above in nerve section atrophy. The nature of the degeneration in the motor nerve endings in acute poliomyelitis has been found to be identical in most respects with that observed in wallerian degeneration following nerve section.[2]

Ken Kure[8] and his collaborators have claimed that destruction of the sympathetic nerves results in the experimental animal in dystrophic and atrophic changes in the skeletal muscles. Other investigators, however, find little or no evidence that a lesion of this fiber system produces any trophic changes in skeletal muscle. The need of further investigation of the role of the sympathetics in relation to the health of striate muscle is quite apparent.

Muscle tissue demands an adequate blood supply but in general it may be considered a hardy tissue. Alterations in blood circulation must be quite severe before ischemic changes occur. Fishback and Fishback[9] have shown that much of the blood supply may be removed with only mild effects upon the muscle, which becomes pale and its fibers may be slightly swollen. Complete deprivation of blood supply results in death of the muscle cells, and gangrene. The so called ischemic paralysis usually regarded as resulting from interference with either the arterial or venous circulation or both is still poorly understood as demonstrated by Brooks.[10] Of interest is the report of Meszaros[11] who studied the peripheral vascular system in ten cases of progressive muscular dystrophy and noted morphologic changes in the capillary vessels and a slowing of the blood flow. He interpreted his findings as pointing to a retardation of vascular development, as secondary to a disturbance of the autonomic nervous system. The resulting anatomic and functional alterations of these small vessels plays a role in the metabolic disturbances assumed to occur in the muscles of patients with progressive muscular dystrophy. Again it is very obvious that our knowledge of this phase of muscle nutrition is quite vague.

The lymph circulation in skeletal muscle has received very little attention. It may be pointed out that the existence of a lymph space in the muscle spindle, noted by Sherrington, suggests the need for study of this component both in healthy and pathologic muscle.

Attention should be called also to the importance of an adequate and properly balanced diet for the maintenance of the health of muscle. The improper supply of elements of nutrition such as vitamins, or a disproportion in carbohydrates, fats and proteins, etc., may lead to degeneration of muscle fibers even though the innervation and blood supply may be quite uninvolved. Such a condition has been described in so called "nutritional dystrophies." Again manifold problems in muscle metabolism present themselves.

The present concept of muscle atrophies and dystrophies observed clinically is based primarily upon the consideration of whether the damage is primarily in the nervous system or in the muscles. Lesions of the nervous system have been associated with the atrophies, whereas the dystrophies have been grouped under the so called myopathic or primary muscle diseases. In this latter group have been included also such clinical syndrones as myasthenia gravis, amyotonia congenita, and other obscure muscle disorders. Pathologic studies have failed to establish with any definiteness the nature of these disorders. In Figure 6b a section of atrophied muscle, ten weeks after nerve section, is shown with a specimen of normal muscle for comparison. The disappearance of the cross striations, the degeneration of the muscle fibers with replacements by fibrous tissue, and the increase in nuclei are striking features of this type of atrophy. All muscular nerves and nerve endings have degenerated. The muscle changes have occurred secondarily, resulting from a primary lesion of the peripheral nerve.

In contrast to this picture, Figure 6c shows a section of muscle obtained from a case of pseudohypertrophic muscular dystrophy. Marked destruction of muscle tissue is apparent. There is an absence of nuclear multiplication, and of particular interest is the appearance of the intramuscular nerves and their endings. Irregular fragmentation and vacuolar degeneration of the axons have produced a bizarre picture. It is quite evident that there are changes in both the muscle fibers and the nerve endings. Studies are now in progress with a view toward differentiating between primary and secondary changes in both the muscle fibers and their nerves.

Figure 6d is a biopsy specimen from a case of amyotonia congenita (Oppenheim's disease). Here may be seen fibers of varying size, an apparent excess of nuclei and capillary hyperplasia. Many authors have considered this muscle disorder to be due to a lack of development of the musculature, the persistence of a fetal state. This has not been established, however, and further study is indicated.

These facts are of significance for the physical therapist because of the need for intelligent and rational use of the commonly employed therapeutic measures. The indiscriminate use of electrical stimulation has already received much attention, and indications and contraindications are being better defined. This is particularly true of the treatment of infantile paralysis where early stimu-

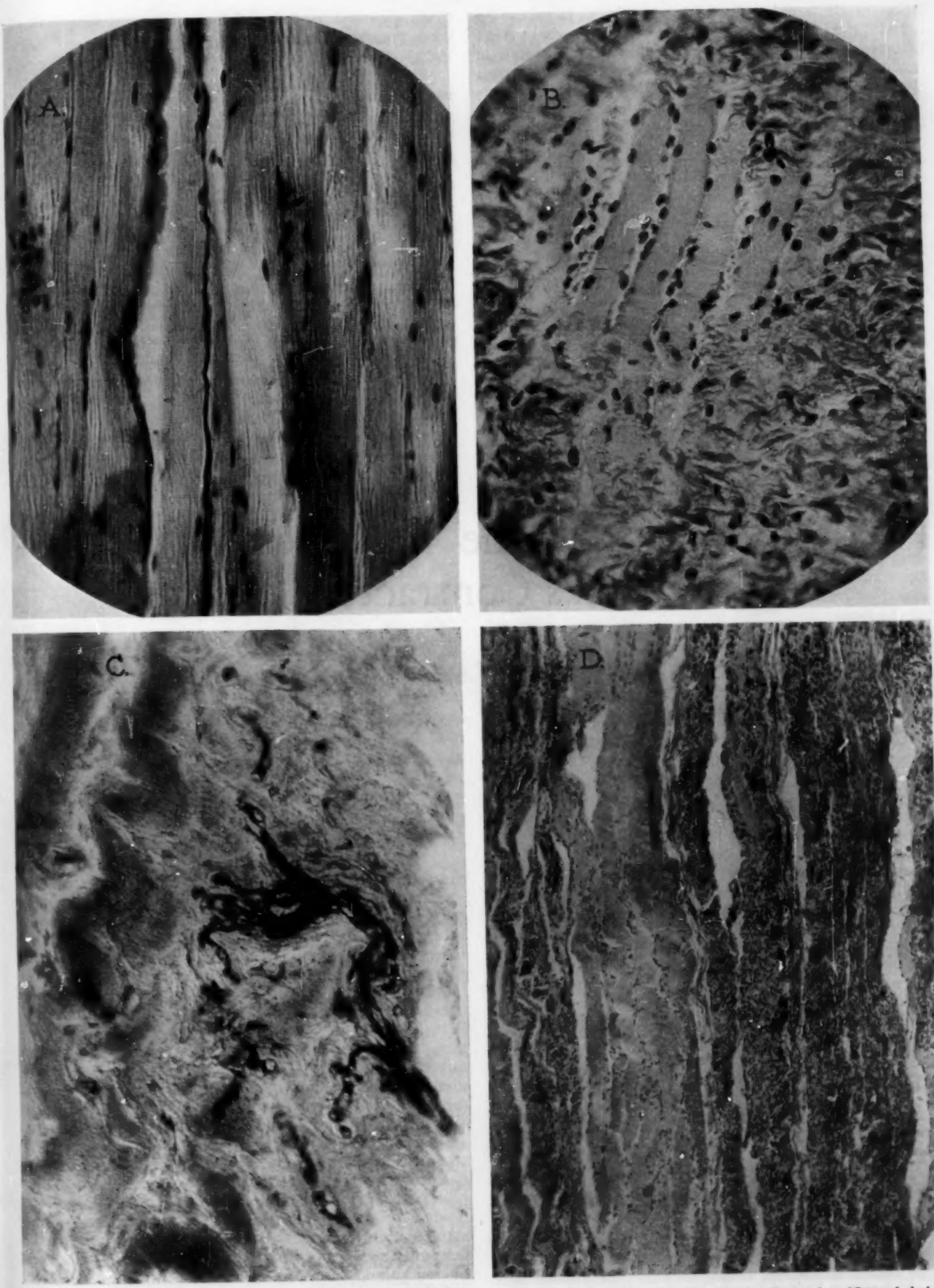


Fig. 6. A—Normal skeletal muscle (monkey) Magnification x 350. B—10 weeks nerve-section atrophy (monkey) Magnification x 350. C—Pseudohypertrophic muscular dystrophy (human) Magnification x 350. D—Amyotonia Congenita (Oppenheim's) (human) Magnification x 350.

lation of the paralyzed muscles has been found to be harmful. The substitution of rest during the early stage followed later by carefully regulated exercise and muscle reeducation has been advocated. The value of electrical stimulation in this later stage has been subject to controversy. Some workers have maintained that electrotherapy is of service in aiding the return of function of paralyzed muscles. Others have objected to its use. Recent experiments on animals undertaken by the author in collaboration with the physical therapy department have verified the clinical observations of harmful effects of electrical stimulation of paralyzed muscles in the *early* stage. Further studies are now in progress with a view toward establishing the actual effects of eletrotherapy in such paralyses and other muscular disorders. Similarly, the use of massage, heat, and passive movements is being studied experimentally.

There is much to be learned regarding the specific requirements of diseased muscles. The cooperation of the neurologist, orthopedist and physical therapist, both in the clinic and in the experimental laboratory is needed to clarify our knowledge of the nature and treatment of these muscle disorders.

BIBLIOGRAPHY

1. Boeke, J.—Innervation of Striped Muscle. Brain, Vol. 44, P. 1, 1921.

2. Chor, H.—Nerve Degeneration in Poliomyelitis. VI. Changes in the Motor Nerve Endings. Arch. Neurol. & Psychiat., 29, P. 344, Feb. 1933.

3. Sherrington, C. S.—On the Anatomical Constitution of Nerves of Skeletal Muscles. Journ. of Physiol., Vol. 17, 1894-5.

4. Hinsey, J. C.—Some Observations on the Innervation of Skeletal Muscles of the Cat. Journ. Comp. Neurol., 44, P. 87, 1927.

5. Tower, S. S.—Atrophy and Degeneration in the Muscle Spindle. Brain, Vol. 55, P. 77, 1932.

6. Chor, H., and Dolkart, R. E.—Muscle Atrophies. I. Water and Nitrogen Studies in Simple Disuse Atrophy. Proc. Soc. for Exper. Biol. and Med., 32, P. 1437, 1935.

7. Tower, S. S.—A Search for Trophic Influence of Posterior Spinal Roots on Skeletal Muscle. Brain, Vol. 54, P. 99, 1931.

8. Ken Kure—Ueber die Pathogenese der Dystrophia musculorum progressiva. Klin. Wchnschr., 6:691-693, April 9, 1927.

9. Fishback, D. K., and Fishback H. R.—Studies of Experimental Muscle Degeneration. I. Factors in the Production of Muscle Degeneration. Amer. Journ. of Pathol., Vol. 8, March, 1932.

10. Brooks, B.—Diseases of Blood Vascular System of the Extremities. Jour. Bone and Joint. Surg., Vol. 28, P. 326, 1924.

11. Meszaros, K.—Gefässveränderungen bei Muskel-dystrophie. Monatschr. f. Psychiat. u. Neurol., 87:180-184, Nov., 1933.

Physical Therapy in the Treatment of Dupuytren's Contracture

Henry W. Meyerding, M. D.,[1] and Frank H. Krusen, M. D.[2]

Physical therapy in the treatment of Dupuytren's contracture divides itself into two phases: (1) its use in some form in the treatment of very early cases, in which no operation has been performed; and (2) its use following operation. A careful search of the literature reveals practically no detailed information on the subject. Although a great many have written on Dupuytren's contracture, and a considerable number have recommended physical therapy,[10, 11, 12] very few specific data on the exact application of these physical agents have been given. Jones and Lovett stated that: "In the very early stages, exercises designed to hyperextend the fingers should be prescribed. The patient should be instructed to stretch the contracture regularly. Operative measures are required when the deformity is more marked." Mennell wrote: "Dupuytren's contracture can, I firmly believe, be prevented from causing deformity if the trouble is detected early enough and the patient is instructed to perform for a few minutes twice daily the exercise of hands clasping and turning spaced with a little deep kneading of the palm. Otherwise, when the deformity is fully established, no physical treatment seems to be really effective. Treatment after operation should proceed on general lines."

Unfortunately, patients rarely consult a physician during the early stage when the physical measures recommended by Jones and Lovett and by Mennell would be of value, and usually the condition has progressed to such a point that operation is necessary. If a patient is seen early and fails to respond to the physical measures, operation should be performed without delay. Davis believed that delaying operation has had the unfortunate effect of making contracture extreme, "making impossible complete eradication of diseased tissue and permitting the secondary changes in the skin and joints which are so frequent causes of recurrence."

If the contracture has progressed to a point where the palmar fascia has become a thick mass of scar tissue, operation must be resorted to. The futility of attempting manipulation without operation in such cases was brought home by the comment of Baron Dupuytren, more than a century ago, in his original description of the disease. He stated: "A person attacked by this infirmity, attached to his finger a weight amounting to one hundred fifty pounds (68 kg.), without influencing in the least the degree of flexion." Wolf has pointed out that, "It is obvious that no form of physical therapy can affect scar tissue." If, as is usually the case, an operation has been found necessary, then certain physical measures should be used during the postoperative period. While there has been much detailed discussion concerning the causes and the operative treatment of Dupuytren's contracture, there is very little available information on postoperative physical treatment of the condition. This postoperative treatment divides itself into the application of proper splints, the use of heat, massage, and manipulation, and the prevention of recurrence of the deformity. The operation removes or divides the contracted palmar fascia, and clears the way for the physical therapeutic treatment of the involved joints, muscles,

1. Section on Orthopedic Surgery, The Mayo Clinic, Rochester, Minn.
2. Section on Physical Therapy, The Mayo Clinic, Rochester, Minn.

and tendons. This can be compared to the manner in which operation prepares the parts for the conservative treatment of Sir Robert Jones, in cases of Volkmann's ischemic contracture.

Baron Dupuytren, in discussing the postoperative treatment in his first case, stated that after he had carefully divided the contracted palmar fascia, "the wounds were simply dressed, with dry lint and the fingers kept in the state of extension, by a suitable apparatus." When the hand became swollen and painful the next day, he ordered the hand to be bathed continually in Goulard's solution, which gave considerable relief. "Finally, in the course of some days, the swelling of the hand disappeared and the wounds were healed. . . . The patient continued to carry the apparatus for another month, in order to oppose the reunion of the edges of the divided fascia; and when at length this was removed, we had the satisfaction of seeing that he could flex his fingers with facility and that the stiffness which remained was only due to the forced extension in which the articulations were held for so long a time; but this rigidity disappeared when the patient had, for a short time, resumed his accustomed exercises."

Since the days of Dupuytren, two types of surgical procedure have been used in the treatment of Dupuytren's contracture of the palmar fascia. One method is to divide the contracted bands by means of a tenotome, and the other method is to carefully dissect out the contracted fascia through one or more palmar flaps or incisions. For the most part, the latter procedure is now used. In 1882, Bellamy gave an interesting description of his surgical treatment of a case, and of the postoperative care: "As I thought the tendon was uninvolved and still ran in a tolerably free theca, I divided the bands with a von Graefe's iridectomy knife, which is singularly useful for fine plastic work, and extended the fingers forcibly. No good came of this proceeding. I subsequently placed the patient under an anesthetic, and carefully and thoroughly extirpated the entire cicatricial tissues and divided the tendon with antiseptic precautions. The finger was carefully retained in the straight position, a metal circlet was made for the wrist, and a piece of stout steel clock-spring welded into it. This steel spring was carried up the dorsum of the finger and suitably attached to it. By its tension it effectually kept the parts on the stretch, and when the wound had healed, passive and active movements, conducted by the patient himself, brought about an excellent result."

While it is doubtful whether Bellamy was justified, in view of the fact that this condition involves simply the palmar fascia, in dividing the tendon, nevertheless, the description of his method of splintage is of interest. Smith felt that, with regard to the treatment, "Operation upon the contracted bands of fascia by as few incisions as possible, as opposed to the recommendation that many incisions should be made" was the method of choice, the object being, he concluded, "to separate the cut parts as much as possible so that recontraction should be prevented."

Jones and Lovett observed that if the operation of subcutaneous division by multiple punctures is performed, the after-treatment should consist of "early active movements and regular stretching." They also noted that, "prolonged splintage will defeat the objects of this simple operation." Jones and Lovett stated also that the operation of open dissection and removal of contracted bands is frequently indicated, but they failed to make any suggestion as to after-treatment. In 1885, Reeves recommended excision of the contracted band of fibrous tissue rather than subcutaneous division. He stated that after operation he "put the hand in a long back-splint for the forearm and hand, with the fingers fully extended. The bandages had to be relaxed in twenty-four hours, having purposely been applied somewhat firmly, in order to keep up full extension. The wound healed by first intention; and within three weeks, my patient could play the piano, write letters, etc."

Following up the history of the after-treatment of Dupuytren's contracture we found that, in 1890, Macready stated: "It is necessary to observe the difference in the after-treatment between the palmar and phalangeal cases. The palmar can be treated throughout with the ordinary soft metal splint, bent to the fingers and gradually extended. The phalangeal cases, however, are best treated by aid of a dorsal splint with rack and pinion movement over the finger-joints. . . . It is quite possible to obtain complete success, even in severe cases, by using the simple metal splint on the palm, but not without much diligence and constant attention on the part of the surgeon. In all cases, extension should not be made at once, or pain is produced. After division of the bands and straightening of the fingers, they should be allowed to resume their flexed position before the soft metal splint is adapted. Extension, whatever apparatus is used, should not be begun till four or more days have elapsed, and should be continued for a week or more after full extension of the fingers has been accomplished." Again, in 1890, Adams, a voluminous contributor to the literature on Dupuytren's contracture, was reported to have made the following recommendation with regard to after-treatment: "In the after treatment, Mr. Adams still used the steel instrument fitted to the dorsal aspect of the hand with prolongations along the contracted finger or fingers, having joints corresponding to the phalangeal articulations, movable by rack and pinion joints in all cases of phalangeal contraction. In cases of simple palmar contraction, this might be dispensed with, and a padded metal splint capable of being bent to any curve and altered from day to day might be applied. Mechanical extension should be maintained for three weeks, night and day, allowing only a little passive movement; and then gradually discontinued during the day but maintained at night for several months, by a simple form of retentive splint."

There is little in the more recent literature bearing on the proper after-treatment following operation for Dupuytren's contracture. Some of the suggestions in this later literature lead us rather far afield. For instance Jelliffe believed that certain unconscious grasping tendencies were transmitted to embryonic tissues, which persisted in the palmar fascias of certain individuals and that this might be a factor in the development of the contracture. Jelliffe's scholarly paper must be read in its entirety to be appreciated. Until physicians know more about the unconscious, we shall probably have to content ourselves with the more concrete surgical and physical measures which have proved efficacious in many cases of Dupuytren's contracture. Again, Power[13] believed that: "Dupuytren's contracture is not an isolated condition and not a clinical entity, but usually an effect of past or present visceral disease producing irritation of the sympathetic system." In support of his theory that Dupuytren's contracture is of neurogenic origin, he pointed out that the lesion occurs almost always in the region of the distribution of the ulnar nerve. He stated that: "Physical therapy should be tried with the definite objective of depressing the inferior cervical and the first dorsal sympathetic ganglia, and combined with conserva-

tive local surgery if necessary." In his more recent article,[14] he suggests that when signs of sympathetic irritation are present, the conservative surgery be followed by "parathyroid treatment."

One other point should be brought out before final discussion of the postoperative treatment is given. Koch mentioned that: "Another factor, protection of the digital nerves, also deserves added emphasis." Davis pointed out that: "The radical operation of excision of the diseased fascia with immediate skin suture yields very disappointing results. . . . As high a percentage as twenty were definitely worse. This last figure is made up entirely of cases showing perfect anatomical results, yet functionally ruined by scar tenderness and finger anaesthesia. The cause of failure in these cases is apparently inclusion of a digital nerve in the scar underlying the suture line, *or possibly subsequent massage on the dissected nerve, which, denuded of its protective covering, resents unaccustomed pressure.*" (The italics are our own, and stress a point which may be worth considering in the physical therapeutic postoperative treatment.)

With regard to treatment without operation, Davis stated: "Massage, manipulation, extension, hot-water baths, passive hyperaemia, ionic medication, and counter-irritation have been tried for generations without effect, although occasional successes have been claimed following their employment." With reference to postoperative treatment, he recommended; "Continuous splinting for a week . . . followed by massage and manipulation, with night splint only, for a further month."

From the standpoint of physical therapy, the postoperative treatment which we would recommend could be divided into three stages.

First Stage

On completion of the operation, dressings of gauze moistened with equal parts of boric acid and fifty per cent alcohol should immediately be applied over the wound. Such a dressing absorbs the drainage from the wound, and, after twenty-four hours, the gauze dries and adheres to the incision, thus sealing it against infection. Infection may not only interfere with proper progress, but may also lead to complete failure in obtaining a properly functioning hand. After the dressing of the wound, a well padded, dorsal splint is applied. This is readjusted from day to day to maintain extension of the affected fingers. The wound dressing is undisturbed during these reapplications of the splintage. This first stage of rest and tissue stretching usually lasts for ten to fourteen days. Movement is wisely avoided during this period.

Second Stage

At the beginning of the second stage, the stitches are removed with care. It is important to note that the heavy fibrotic scabs which are found around the site of the skin incisions *should not be touched* at this time. During this stage, which usually lasts for about seven days, radiant heat (from a U-shaped, six-lamp baker, containing 60-watt bulbs; or from a 250-watt gas-filled tungsten bulb in a cup-shaped reflector, at a distance of two feet, 61 cm.) is applied to the palmar surface of the hand and fingers for a period of thirty minutes daily. Following heat, passive movements of the fingers are instituted for a period of five minutes, taking great care to see that the movements are sufficiently gentle to avoid opening the skin wound. Early motion is urged, but not at the expense of creating drainage, for fear that infection may result.

Third Stage (Approximately the Fourth Week)

The hand and forearm may now be introduced into the whirlpool bath, since the skin incision should by this time be well healed. The whirlpool bath is an oval tub containing whirling, aerated water which is kept at a temperature of 110° F. It produces marked hyperemia of the superficial tissues and, because of its gentle massage effect, there is relaxation of the musculature and a sedative effect on the peripheral nerve endings. The whirlpool bath is applied for a period of

Fig. 1. Night splint for use during third stage of postoperative treatment of Dupuytren's contracture.

thirty minutes, and it ideally prepares the part for massage and manipulation. Again, the firm scabs around the wound are undisturbed until they fall off of their own accord. At this stage, active, assistive exercises may be instituted. The patient makes an active effort to move the affected fingers, and he is assisted in the completion of these movements by the operator. A period of five minutes is usually devoted to this type of exercise. As treatment continues, the assistive movements of the operator are decreased, and active movements are increased until the patient is able to use the

fingers actively in a normal manner. During the third stage, dressing of the wound is continued until the scabs have fallen off and complete healing has been established. The continuous dorsal splint, however, is removed, and if a tendency to flexion deformity still persists, an aluminum hand splint is applied at night. This night splint (Fig. 1) is usually worn by the patient for a period of one month. At the end of the fourth week, the patient is provided with a baker or heat lamp, such as was just described, and is instructed in its home use. At this time all danger of injury to the dissected nerves, mentioned by Davis, has disappeared, and the patient is shown how to apply the gentle kneading and friction of the palm; he is specifically instructed also in extension and flexion exercises of the fingers, and is further warned to avoid repeated deep trauma to the palm of the hand.

Conclusion

The views expressed in this paper are based on an experience with 273 patients, 448 of whose hands were affected by Dupuytren's contracture. The patients were encountered at The Mayo Clinic. Of cases in which the palmar fascia was excised, results were satisfactory in eighty-nine per cent. Therefore, the patient who is discouraged concerning his condition may, nowadays, take a more hopeful attitude. With expert surgical treatment and with proper postoperative physical therapy, the deformity of Dupuytren's contracture may usually be corrected and a useful, functioning extremity be obtained.

Bibliography

1. Adams, William: Treatment of Dupuytren's finger contraction. Brit. Med. Jour., 1:722 (Feb. 22), 1890.
2. Bellamy, Edward: Note on the treatment of contracted fingers. Lancet, 2:439 (Sept. 16), 1882.
3. Davis, A. A.: The treatment of Dupuytren's contracture. A review of 31 cases with an assessment of the comparative value of different methods of treatment. Brit. Jour. Surg., 19:539-547 (April), 1932.
4. Dupuytren, Baron: Permanent retraction of the fingers produced by an affection of the palmar fascia. Lancet, 2:222-225 (May 10), 1834.
5. Jelliffe, S. E.: Dupuytren's contracture and the unconscious: a preliminary statement of a problem. Internat. Clin., 3:184-199 (Sept.), 1931.
6. Jones, Robert and Lovett, R. W.: Orthopedic surgery. Ed. 2, New York, William Wood and Company, 1929, 807 pp.
7. Koch, S. L.: Dupuytren's contracture. Jour. Am. Med. Assn., 100:878-880 (March 25), 1933.
8. Macready, J.: On the treatment of Dupuytren's contraction of the palmar fascia. Brit. Med. Jour., 1:411-414 (Feb. 22), 1890.
9. Mennell, J. B.: Massage—its principles and practice. Ed. 2, Philadelphia, P. Blakiston's Son and Company, 1920, 535 pp.
10. Meyerding, H. W.: Dupuytren's contracture. Proc. Staff Meet. Mayo Clinic, 10:694-696 (Oct. 30), 1935.
11. Meyerding, H. W.: Dupuytren's contracture. Arch. Surg. (In press.)
12. Meyerding, H. W., and Overton, L. M.: Bilateral Dupuytren's contracture. Proc. Staff Meet, Mayo Clinic, 10:801-803 (Dec. 18), 1935.
13. Powers, Hale.: New light on the cause of Dupuytren's contracture and the possibility of its treatment by physiotherapy. Am. Jour. Physical Therapy, 8:239-241 (Dec.), 1931.
14. Powers, Hale: Dupuytren's contracture one hundred years after Dupuytren: its interpretation. Jour. Nerv. and Ment. Dis., 80:386-409 (Oct.), 1934.
15. Reeves, H. A.: The rapid cure of Dupuytren's contraction by excision. Brit. Med. Jour., 1:481 (March 7), 1885.
16. Smith, Noble: Seventy cases of Dupuytren's contraction of the fingers. Brit. Med. Jour., 1:603-604 (March 25), 1884.
17. Wolf, H. F.: Textbook of physical therapy. New York, Appleton-Century Company, 1933, 409 pp.

An Interesting Case of Arthritis

Beatrice Woodcock

A tall slender girl of thirteen was admitted to the house because of disability in walking. She gave a history of acute illness with sudden onset, sore throat, high fever, vomiting, with stiffness of shoulders developing and extending to elbows, wrists, hips and knees. Temperature soared to 106 F. and remained above normal for three months. During this time she was given eighteen blood transfusions. Spinal punctures ruled out meningitis. Thirteen months after illness, she was seen in clinic and admitted. Tonsils were removed just before she came in.

She had a marked lordosis of the spine, with limitation of shoulder movement on the right. Both hips were ankylosed and knee flexion was limited. Radiographs of the hips showed the joint space to be decreased on both sides, but uniformly, and the acetabulae were deeper than usual. The articular surfaces were smooth and there was no evidence of bony destruction or new bone formation.

She was put up in traction and after two weeks physical therapy was started. The first examination showed no movement in hips, except for a very slight outward rotation. There was no flexion, no extension, no inward rotation.

As we have no diathermy, we applied heat through the bakers and left the heat on for a full half hour.

This was followed by deep massage of the whole limb and shoulder, particularly around the joint. After that, she was given as much stretching as she could stand, and general postural exercise, particularly for abdominals.

The girl was anxious to play tennis again and stood all she could. There was never any flare-up in the joint and when the stretching was over there was no pain.

After six weeks treatment there was considerable gain mostly in abduction which measured twenty degrees. In view of the gain it was decided to manipulate gently under anaesthetic. This was done five times until ninety degrees flexion and thirty degrees abduction was obtained.

After getting the movement started passively, we stressed active movement. Klapp creeping was instituted. The first try was extremely difficult because of limited knee movement, but improved with every effort. She was also made to climb stairs and do every exercise possible to stretch hips and knees. At the end of five and a half months she had free flexion and abduction of hip and full movement of the knees. She could mount stairs two at a time, walk without a limp and dance. Lordosis was markedly improved. She was sent home with instructions to work at exercises and to ride a bicycle.

When she returned to the clinic for a check-up, it was found that she had ninety degrees flexion, thirty degrees abduction, and forty degrees adduction. Inward rotation was slightly limited. She could get her head between her knees and she has no limp.

The Feet in Relation to the Mechanics of Human Locomotion

R. Plato Schwartz, M. D.*
Arthur L. Heath

John Hunter (1729-1796) believed that a knowledge of function was more important than the study of structure. In 1860, John Hilton urged the practical surgeon to "realize that his chief duty consists in ascertaining and removing those impediments which obstruct the reparative processes or thwart the effort of Nature, and thus enable her to restore the parts to their normal condition." Hilton was supported by a Liverpool contemporary, Hugh Owen Thomas (1834-1891). Both men were strong individualists. Their principles are now more commonly practiced than when they lived.

Although this is true, attention continues to be focused upon morphology and structure. We are nearing the end of that era. Osteology was completed when all bones became perfectly described separately and in relation to respective articulations, ligaments, muscle origins, and tendinous insertions. Gross anatomy defined joint motions from muscular relationships on the cadaver. Accurate drawings have long been available; at present, there are no frontiers related to gross circulation and innervation. This proper order has been followed. Today, anatomists and pathologists are exerting their efforts in the field of experimental physiology. Long before this change came, attention was directed to the fundamental laws of locomotion.

James B. Pettigrew[1] (1834-1908) of St. Andrews and Edinburg, was a visualist self-commissioned to analyze, assemble, depict, and correlate a major theme. "The most exquisite form loses much of its grace if bereft of motion, and the most ungainly animal conceals its want of symmetry in the co-adaption and exercise of its several parts . . . the great panorama of life is interesting because it moves. One change involves another, and everything which co-exists, co-depends. . . . Can it be that the animate and inanimate world in this, as in other things reciprocates, and that traveling organs of animals are made to impress the inanimate bodies in precisely the same manner as the inanimate bodies impress each other"?

"This much seems certain: The wind communicates to the water similar impulses to those communicated to it by the fish in swimming; and the wing, when it is made to vibrate, impinges on the air as ordinary sound does. The extremities of bipeds and quadrupeds, moreover, describe wave tracts on land when walking and running, so that one great law apparently determines the course of the bird in the air, the fish in the water, and the biped and quadruped on the land."

The breadth of this theme, expressed in 1867, is almost limitless. It appeals particularly to those of us who have a respect for the unity of all things. The greatest principles, although clearly expressed, have frequently had to wait long for application. Pettigrew's work applied to the living; his principles, therefore, were not necessary for understanding the gross anatomy of the dissecting room of the nineteenth century, nor was his theme an essential part of the information sought in the postmortem study of disease in later years.

Pettigrew had only one contemporary in America. Eadweard Muybridge[2] (1830-1904) was neither a physiologist nor an anatomist. He resigned his position with the United States Geodetic Survey to begin a photographic study of the locomotion of the horse at Sacramento, California, in May, 1872. With periods of interruption, he continued at Palo Alto until 1879. Thereafter, for more than twenty years, the work was continued at the University of Pennsylvania. One large volume of his work is devoted to photographic records of locomotion of male and female figures. They provided confirmation of the group action of muscles.

Marey[3] (1830-1904) was the French contemporary at the University of Paris. He applied pneumographic recording apparatus to the study of locomotion. In contrast with the respective fundamental contributions of Pettigrew and Muybridge, the value of Marey's work was chiefly in relation to history of the subject.

The symphony of muscle function correlated with osteo-articular form and structure was the essential theme presented by the work of these men. They revealed the relationship of all forms of locomotion, while Pettigrew associated the differences to the character of the respective media—land, water, and air. In this, therefore, we see emphasized the true principle of muscle function as related to the interaction of opposing groups, and applied to all three forms of locomotion.

Serious consideration has not been generously devoted to the study of human gait, except in such rare instances. The present treatment of deformities, etc., rests largely upon the training in morphology which dominated the past century. The general attitude of mind thus created was unattracted by the type of investigation required for penetrating the shield of unfamiliar difficulties associated with the study of the extremities in motion. Appreciating the propriety of disagreement, it seemed most evident that methods of precision were indicated for the improvement of that branch of surgery which is devoted to the treatment of impaired function of locomotion. Had not the advancement of medicine been defined by the mileposts of the clinical thermometer and the electrocardiograph? In every phase of human need, the requirements have been most satisfactorily met when impressions were replaced by facts. A rational premise relevant to human locomotion was dependent upon the interpretation of records resulting from the application of physical laws which have a constant and consistent behavior.

The record of personal failures in this effort has been previously acknowledged. These experiences were profitable in that each one more clearly defined the particular requirements. In the end, we succeeded in recording the duration of weight-bearing time on the heel, midfoot, and forefoot. This electrobasographic method of recording human gait has been previously described. Clinically, it is practical from the viewpoint of technical simplicity, economy of operation, and precision of inter-

From the Department of Surgery, Division of Orthopedics, Rochester University, School of Medicine and Dentistry.
*Associate Professor of Orthopedic Surgery.
Presented at Russell Sage College, February 14, 1936.

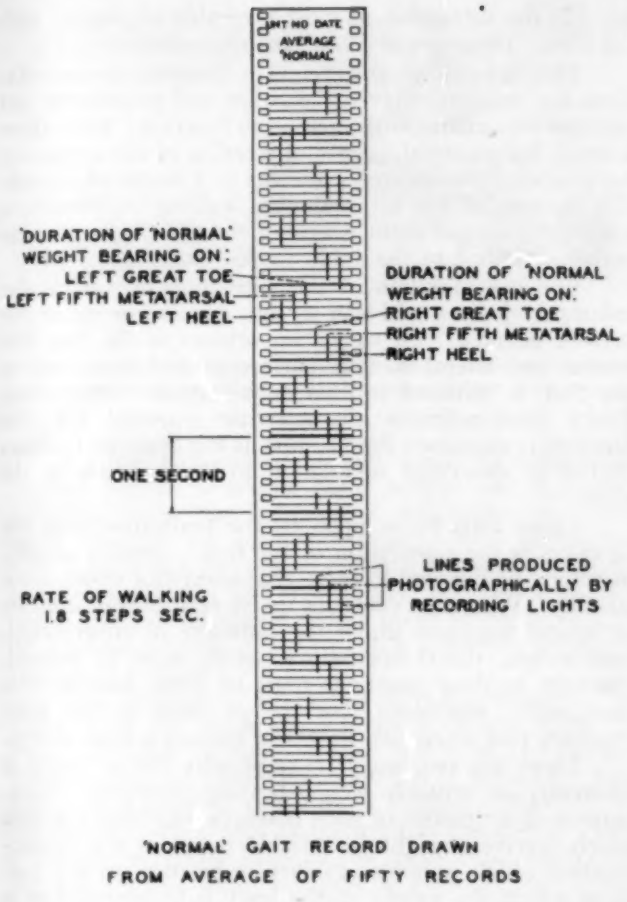


Fig. 1.

pretation, to the thousandth of a second. Without error, it reveals any disproportion in the duration of weight-bearing on the respective functional areas of each foot while the subject walks a distance of fifty feet. (Fig. 1)

For these reasons, the electrobasographic records of human gait reveal the presence of structural and functional abnormalities which alter normal walking. Such departures from normal are evident without reference to location or the cause of abnormally long or short durations of weight-bearing. This accomplishment was both gratifying and discomforting. Discomfiture arose from the fact that such precision records could not be explained by prevailing textbook statements and clinical practices related to foot function, in stance and gait. It became most evident that "Without principles deduced from analytical reasoning, experience is a useless and blind guide." (Cullen)

Attention was, therefore, directed to the structural characteristics as related to the observed and recorded function of the foot. For want of time, only those points related to pronation will be discussed.

Over a period of the past fifty years, the "arches" of the feet have been a pivot of discussion. This impression of longitudinal and transverse arches has dominated because of prevailing contours. Because of this associated impression, the osteo-articular structure of the foot has long been accepted with full assurance of understanding. If it has not become trite, the subject has been accepted without requiring further consideration for an interpretation which is more essential to a sound premise for rational treatment of symptoms resulting from weak, pronated feet.

Such is the fixed opinion. Unlearning is frequently more difficult than the acceptance of new facts pertaining to a recent discovery. Although previous efforts have been so well expressed, "longitudinal arches" are still suspended in adhesive slings, or propped up with steel plates and rigid shanks in shoes.

In 1895, Walsham,[4] surgeon in charge of the Orthopedic Department and Lecturer in Anatomy at St. Bartholomew's Hospital, London, stated that, "the mechanism of the instep is in no way comparable to that of an ordinary arch." There is no keystone. The weight from above is received wholly upon the posterior part of the foot, and that part of it which is transmitted forward acts in the anterior-posterior axis of the bones; whereas, in an arch, the weight is received from above along its whole span. Moreover, in the place of a rigid, passively resisting structure, we have an elastic, living mechanism, actively adapting itself to every change of position and function. Golding Bird also shows the weak points in the simile. He says (Guy's Hospital Reports, 1883): "There are no piers on which the extremities of the arch can rest, nor by which they can be prevented from separating from each other. The (so called) arch of the foot is kept in its position by the tying together of its two extremities by means of two distinct sets of bands, one of which is purely passive in its operation (the ligaments), and the other more or less active (the muscles)."

We must, for at least the present, agree with these men in their regard for the foot as a living structure with the astragalus resting directly upon the os calcis. This structural relationship is of primary importance when regarded as a living, osseous structure suspended in ligaments and muscles. Moreover, the bones of the foot retain their arch-like contour by virtue of normal neuromuscular and ligamentous function. We must, therefore, not assume full understanding of function from observation of dissection and the living foot in repose.

The functional significance of the os calcis is the fact that it is the structure first to receive weight in making a normal step. Normal function of the foot in completing the step is dependent upon a prevailing sensitivity of reflex balance in its multi-jointed, therefore, semi-mobile structure. This sensitive reflex balance, which normally controls the rhythmic motion and accurately times the position of the foot with respect to the leg in normal gait, is the function of a normal neuro-muscular mechanism in relation to

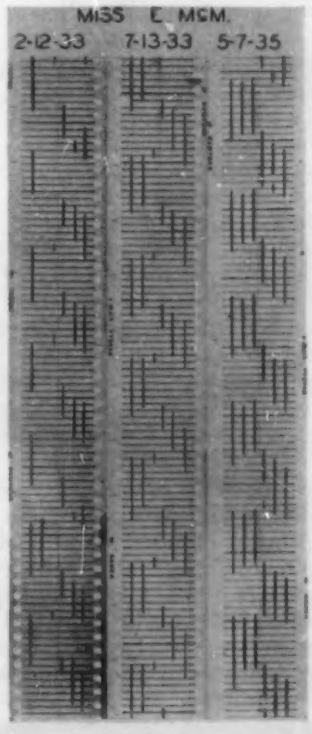


Fig. 2

On 2/12/33, gait record revealed left calcaneol weight-bearing due to infantile paralysis involving only gastrocnemius and soleus.

On 7/13/33, heel and midfoot weight-bearing following sub-astragalar arthrodesis and peroneal transplantation, posteriorly.

On 5/7/35, marked improvement in function on all three weight-bearing areas of the left foot fifteen months after operation. (Note corresponding improvement in function of right foot.)

normal osteo - articular and ligamentous structures. The prevailing instability of the foot, with or without deformities, following impairment of muscle function is glaring evidence in support of this statement. These abnormalities have received much attention, chiefly, if not only, in relation to the operative procedures designed for their correction.

Only by means of electrobasographic records has it been possible to record any expression of functional limitation of the foot in walking. Moreover, this is the only method of recording the presence or absence of functional improvement resulting from any form of treatment including operation. (Fig. 2)

Fig. 3

The axis of weight - bearing passes from tibia through the middle of the body of the astragalus. The axis of weight-bearing of the os calcis is 1.2cm. lateral to the corresponding axis of the tibia. (8/16/35)

Most of our adult population have uncomfortable, if not abnormal feet. Without weight-bearing, such feet may appear to be normal in contour. Under the influence of superincumbent weight, the medial aspect of the foot becomes prominent in company with a lowering of the medial side, while the outer aspect of the heel projects lateral to the external malleolus. These characteristic evidences of pronation may prevail in the first, second, or third degree. Beyond the middle of the third decade, they are invariably accompanied by the physical signs as well as the subjective symptoms of foot strain. Imbalance prevails, although there may be no demonstrable neuro-muscular pathology.

Attention is, therefore, directed to the osteo-articular relationship of the tibia, astragalus, and os calcis. The medial and lateral condyles of the ankle provide for the primary motions, dorsal and plantar flexion, of the astragalus. From the posterior view, it is evident that the axis of tibial weight-bearing passes through the middle of the astragalar body. (Fig. 3.) The ankle point is, therefore, doubly protected with relation to medio-lateral stability—(1) respective condyles which form a mortise for (2) the astragalus in most favorable alignment with the tibia. These are predominant characteristics.

The morphological differences between the articulations for the respective malleoli are less prominent, but of great importance with relation to function. They allow a small, but essential, degree of rotation of the astragalar body around the internal malleolus as a center of motion. The motion of the astragalus in walking is, therefore, compound instead of the simple dorsal and plantar flexion usually ascribed to the ankle joint.

Full consideration of the subastragalar (astragalo-calcaneal) joint would lead us into details foreign to our present purpose. Of major importance is the fact that medial and lateral motion (inversion and eversion) of the foot is initiated in this subastragalar articulation. Every osteo-articular characteristic essential for this function is expressed herein, just as the opposite findings prevail as described in relation to the function of the ankle.

These facts force upon us the realization that the os calcis is the foundation of the foot. Inquiry should, therefore, be directed to those characteristics which favor stability. Where its contours or its relationship indicate structural weakness under the influence of superincumbent weight, the compensatory agents must be defined. Answers to these questions must be given because it is functionally significant that the os calcis is the bony structure first to receive weight in making a normal step.

There are two major reasons why the os calcis is inherently an unstable weight-bearing structure. Comparison of a number of such bones reveals that the area which receives weight is variable in all of the characteristics which promote stability in relation to the axis along which the weight of the body is transmitted to it from the tibia and astragalus. (Fig. 4.) Second, this axis through the leg is 1.2 cm. medial to the respective axis which passes through the os calcis. (Fig. 3.) This malalignment of axial relationships is weakly compensated for by the medial projection of the sustentaculum tali. (Fig. 5.) This, together with the inferior calcaneo-scaphoid ligament, passively supports the head and neck of the astragalus. The active support which compensates for these fundamental structural weaknesses is expressed by the tibialis posticus and flexor longus hallucis (to a less extent by the tibialis anticus). These facts reveal that there are major intrinsic influences at work in favor of the os calcis rotating into the pronated or weak position of the foot. Congenital or acquired shortening of the calf muscles is a common extrinsic cause of pronation and prevails in both sexes, by far most frequently in women. With them, it is usually an acquired characteristic associated with the height of heels worn after adolescence.

Fig. 4

Posterior view of two pairs of os calci. The rounder, plantar weight-bearing "surface" favor the weak, pronated position of the foot. (10-7-29)

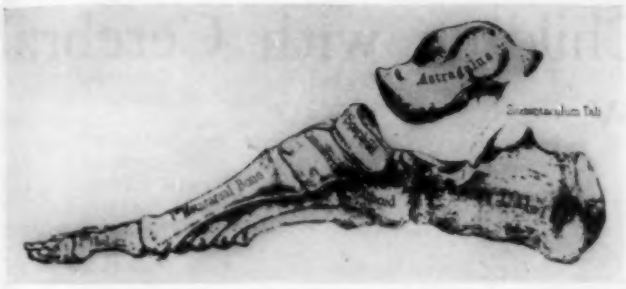


Fig. 5

(Ellis, 1889) Medial aspect of right foot showing relationship of astragalus to os calcis, sustentaculum tali and scaphoid.

A weak foot caused by any one or a combination of these factors invariably has a normal medial contour when not under the influence of weight-bearing. With weight-bearing, the astragalo-scaphoid level of the foot rolls inward and downward. This is the weak, pronated position commonly, but erroneously, referred to as "flat feet." Such displacement cannot occur at this level without internal rotation of the os calcis under the astragalus (position of valgus).

This fact cannot be too strongly emphasized. The converse of the statement may more clearly reveal the reason for such emphasis. If the heel is held in external rotation with the astragalus, (position of varus) the forefoot cannot pronate, (position of valgus). Each of you can readily verify this statement for yourselves. With this premise clearly in mind, the practice of supporting the "longitudinal arch" becomes an evident gross fallacy. Measures should and must be provided to prevent the inward rotation, namely, the varus position, of the heel. This done, prevailing strain is eliminated without interfering with the mobility of the foot which is imperative for preservation of its function.

Electrobasographic records proved the validity of this conception of the relationship of the os calcis to pronated feet. Moreover, these records supported the clinical progress of patients in defining the efficiency of treatment. In this effort, we were always required to use the patient's shoes. This requirement was inseparable from a major difficulty, namely, the shoes too frequently did not hold the os calcis. Along with this, many other characteristics of shoes were recorded. Moreover, the relationship of such shoes to feet bore a definite adverse influence upon the local and remote symptoms associated therewith.

These studies further revealed that the inherent imbalance of the os calcis was not prevented by available shoes which were worn on feet without symptoms. Despite the time and effort involved, it was imperative to challenge this new, and in some respects, undesirable problem of mal-fitting shoes. All such shoes have been made without knowledge of the requirements of the foot in motion.

Through cooperative effort it was our purpose to design correct shoes; shoes that would meet the functional requirements of the foot in motion. Through the medium of electrobasographic records and slow-motion pictures, we directed the experimental work and verified the results of our efforts.

Twenty-four girls were admitted to the Training

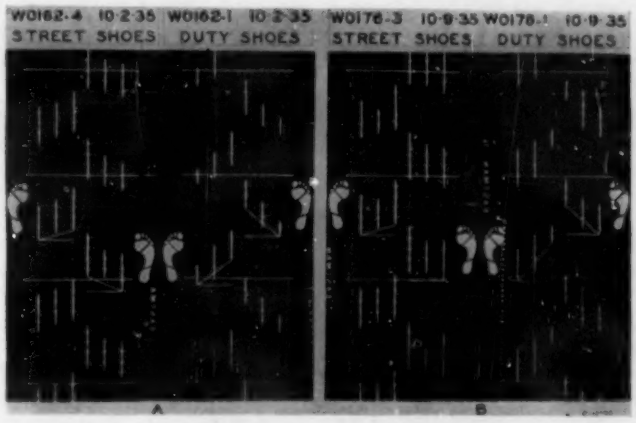


Fig. 6

The difference in the sequence and duration of weight-bearing on the three functional areas of each foot is revealed. With street shoes, pronation is present in every step. With duty shoes, in each step the feet are in normal balance during the period of weight-bearing in motion.

School for Nurses at the Strong Memorial Hospital in September of 1935. Electrobasographic records were made of each girl in the shoes which they wore, and in the duty shoes which were prescribed for them.

The duty shoes were made from lasts which have been designed on the basis of the experimental work presented. As previously stated, no thought of corrective features for sick feet has prevailed in this effort. The effort was expressed, therefore, in the evolution of a scientific program focused upon the problems of human locomotion.

We are all aware of the numerous claims of previous efforts to solve this problem. We also know, with regret, that none of these claims have given the answer. The reason is probably found in the fact that shoes have been made without regard for requirements of the foot as a semi-flexible, weight-bearing structure carrying a load in motion. They have been made and fitted with regard for only the length and width of the foot at rest.

Our experiments have revealed the influence of such shoes upon the feet. Those shoes further provoked an already unstable structure. Balance of the foot in each phase of the step is essential for confidence and a graceful gait. Our records reveal that shoes have been produced which actually meet this need. (Fig. 6)

. . . *"Let the form of boot-lasts correspond in shape to that of feet in action* . . . Then, as I believe, the foot may be clothed with every reasonable regard for comfort and elegance, and yet, attaining its highest development, be preserved in the fulness of strength and of beauty." (Ellis,[5] 1889)

References

1. Pettigrew, James B.: "Design in Nature." Longmans, Green and Co., London. 1908, III: 1074.

2. Muybridge, Eadweard: "The Human Figure in Motion." Fourth Impression. Chapman and Hall, Ltd., 1913, London.

3. Marey, E. J.: "De la Locomotion Terrestre chez les Bipèdes et les quadrupèdes." J. de l'Anat. et de la Physiol. IX, 42, 1873.

4. Walsham, W. J. and Hughes, W. K.: "The Deformities of the Human Foot with Their Treatment." Bailliere, Tindall and Cox, London. 1895, p. 6.

5. Ellis, Thomas S.: "The Human Foot." J. and A. Churchill. London, 1889.

A Study of Fifty-Nine Children with Cerebral Palsy

Caroline Hubert Elledge

During the two and one-half years as social worker in the orthopedic clinic at Children's Memorial Hospital, my attention was drawn to and held by the "spastic" children. They stood out in the group of handicapped patients as being especially in need of all the facilities available for adequate child care, but because of the very nature of their handicap, efforts made outside the hospital to improve their educational, emotional, or environmental status were frequently resisted. There was continuous need for interpretation of the individual child's problem, and frequent questioning on the part of others drawn into the social plan, as to the child's mentality and his ability to take advantage of additional opportunities, should these opportunities finally be granted. In building up a defense, it was necessary for the social worker to gather as much data as possible concerning the child's mental ability, his emotional and environmental background, and his response to a school program. The present study was the outgrowth of a sustained interest, first aroused in a few outstanding cases.

The fifty-nine patients were selected from a group of about one hundred children attending the clinic from September, 1931, to April, 1934, whose diagnosis placed them in the medical category of cerebral palsy. No attempt has been made to distinguish between the method of acquiring cerebral palsy. Infants, children who were so mildly spastic as to require very little treatment, those who had been under supervision in the clinic for only a short time, and a few children who had not completed the various examinations used in the study, were excluded. The ages of the patients at the time of their admission to clinic ranged from one month to twelve years. As the age limit at Children's Memorial Hospital is thirteen years, children over twelve years are not usually admitted to the clinic when long-time care is anticipated. Table I indicates the distribution of patients according to age.

TABLE I: Age Distribution at the Time of Registration in Clinic

Under 3 Yrs.	3-5 Yrs.	5-7 Yrs.	7-9 Yrs.	9 Yrs. or Over
20	11	20	3	5

Only a small number of the fifty-nine children had been seen by other physicians previous to clinic admission. According to the data available on the social and medical histories, twenty-six of the childhen had not been previously examined for recommendation as to treatment of their handicap; three had been examined in other clinics and transferred to Children's Memorial Hospital for treatment; seven had been examined by private physicians and referred to the clinic after the diagnoses had been made; one child had been treated at a private hospital and later transferred to the clinic; one had been treated by a chiropractor; and in twenty-one cases, no information was given.

The source through which the family became aware of facilities for clinic care for their spastic child is of interest, and is classified in table II.

TABLE II: Source of Referral to Clinic

Family or friends	29 patients
Medical agencies	23 patients
Social agencies	4 patients
Other sources	2 patients
Unknown source	1 patient
Total	59 patients

In the group classified under medical agencies, eight patients were referred by private physicians; five by other clinics; three by the Visiting Nurse Association; three by the Infant Welfare Society; and one by an Industrial Nurse. The patients referred by social agencies included one from the Juvenile Protective Association; one from the Illinois Children's Home and Aid Society; and two from family welfare societies. Those classified according to "other sources" were rather out of the ordinary: one child was sent in by a bill collector who came to the home; and the other by a salesman.

MEDICAL DATA

In an interpretation of the medical factors involved in the physical handicap known as cerebral palsy, it is of interest to discuss some of the possible causes of this condition. Circumstances which may bring about this brain damage are said to fall into three main classifications: first, the impairment of the development of the foetus, as in the cases of degenerate parentage, lues, alcoholism, or the premature birth of an infant; second, injury at the time of birth due to difficult labor or the use of forceps; third, a hemorrhage acquired after birth either through an accident to the skull or from encephalitis, if this disease occurs between the ages of one and four years.

In attempting to trace possible causes for the spasticity in these fifty-nine children, it was necessary to rely upon the mother's history of the birth and subsequent complications or illnesses. As it was not possible to verify these histories, the information can be interpreted only as an indication of the groups into which these fifty-nine cases of cerebral palsy probably fall. For example—the mother would describe the birth as "normal," and would add that the child had been difficult to resuscitate. These cases were classified as difficult labor. Although there were no patients in which a diagnosis of encephalitis was actually verified, it was felt that those children who came to clinic following an "attack of high fever, prolonged over several days, after which they were unable to carry on previous activities" had probably had encephalitis. There were additional factors which might possibly have brought about the cerebral palsy: for instance, some physicians are of the opinion that a pregnancy involving twins may result in either one or both developing a brain hemorrhage due to their position in the uterus; also, an injury might occur due to a delivery by an inadequately trained midwife. Table III indicates the possible causes of brain damage in the fifty-nine children studied.

Medical Social Caseworker, Children's Memorial Hospital, Chicago, Illinois.

The writer wishes to express her appreciation to Dr. Joseph Brenneman, Dr. Ferdinand Seidler, Mrs. Babette Jennings and Miss Marian Russell, for their assistance in reading the manuscript and giving helpful suggestions.

TABLE III: Possible Causes of Brain Damage

Developmental		14
Degenerate parentage	1	
Congenital lues	2	
Premature birth	11	
Birth injury		17
Normal delivery—difficult resuscitation	6	
Caesarian—after difficult labor	3	
Midwife delivery—after difficult labor	2	
Forceps delivery	6	
Acquired		5
Possible encephalitis	3	
Accident to skull which may have caused brain damage	2	
Other possible causes		5
Twins (normal delivery)	3	
Midwife (normal delivery)	2	
No known cause	12	12
No information	6	6
Total		59

In several instances, there was more than one factor which might have caused the brain damage. Altogether, there were five sets of twins, three in the normal delivery classification, one in the difficult labor group, and one in the forceps delivery. One child with a forceps delivery also had a high fever and symptoms of encephalitis later in life. Additional medical complications included three children who were epileptic as well as spastic, and one child who was deaf.

Treatment of these fifty-nine children involved surgical intervention in many instances, and physical and occupational therapy for all patients. The orthopedic surgeons supervised all physical and occupational therapy. Children attending the special schools received physical and occupational therapy through the school; while those attending the regular school or not in any school were cared for in the home by the Visiting Nurse Association. Physical therapy for hospital patients was under the direction of a Visiting Nurse who is stationed at the hospital. Out-of-town clinic patients also received treatment and instructions through the Hospital Visiting Nurse.

Of the fifty-nine children studied, surgery as well as occupational and physical therapy was used in thirty-three cases, while only physical and occupational therapy were employed in twenty-five. One child was being treated for a congenital dislocation of the hips and as she was wearing casts during the time of the study, no specific treatment for the spasticity could be given.

The frequency of clinic visits depended upon the individual case and the type of treatment recommended. If the child had recently been discharged from the hospital, visits usually were spaced at about every two weeks, and gradually lengthened to once a month, once every two months, and as the child improved, to once every three to six months. On the whole, the patients were co-operative in keeping clinic appointments, forty children attending quite regularly, sixteen irregularly, and only three being delinquent over long periods of time. A large number of the children attended special schools and were brought to the clinic by the school nurses and physical therapists, which influenced regularity in the group as a whole.

The length of time spent in the hospital was also dependent upon the type of treatment: whether for observation only; for intensive physical therapy; or for surgery. The shortest period for any one child was one day of observation,[1] and the longest period was six months during which time the patient had several operations, and intensive physical and occupational therapy.

1. This child was taken out of the hospital by the parents against the advice of the physicians.

Table IV indicates the type of treatment for the thirty-seven children who were admitted to the hospital.

TABLE IV: Type of Treatment During Hospitalization

Number of Admissions	Total Patients	Observation and Physical Therapy Only	Casts	Number of Operations 1	2	3	4
1	20	3	..	13	4	..	..
2	8	..	..	4	2	2	..
3	8	..	..	..	4	3	1
4	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..
6	1	..	1	..	..	..	..
Total	37	3	1	17	10	5	1

Of the children who were admitted to the hospital more than once, eight were admitted for a period of observation and physical therapy before being re-admitted for surgery. The child who was admitted six times was admitted for cast treatment of bilateral congenital dislocation of the hips and not for treatment of the spasticity.

In an attempt to classify results of treatment, information on the medical records was interpreted according to the following examples: If a child dragged one foot noticeably previous to operation and physical and occupational therapy, and walked very well several months later, the improvement was described as "great." If, however, a child was said to have had no use of his right arm and to walk with his right foot turned inward prior to operation and physical and occupational therapy, and one year later used this right arm freely but still walked with his foot turned in, the child was considered to have shown "some improvement." If, after full co-operation between the medical and patient groups, the child still showed no improvement, the results were classified "unimproved."

TABLE V: Patients Receiving Surgical Treatment and Physical and Occupational Therapy

Results of Treatment	Hemiplegia	Paraplegia	Tetraplegia	Total
Great Improvement	6	7	0	13
Some Improvement	7	7	4	18
Unimproved	1	1	0	2
Total	14	15	4	33

Where physical and occupational therapy were used without surgical intervention, the same interpretation of results of treatment was given, except that a longer period of time was allowed in which to demonstrate the improvement, namely, one child was very spastic in the right hand, but within two and one-half years he could play the piano with both hands and was able to use the typewriter as well, and was therefore described as showing "great improvement."

TABLE VI: Patients Receiving Physical Therapy and Occupational Therapy Only

Results of Treatment	Hemiplegia	Paraplegia	Tetraplegia	Total
Great Improvement	3	2	1	6
Some Improvement	4	4	4	12
Unimproved	1	3	3	7
Total	8	9	8	25

The interpretation of the medical records was carried on under the supervision of one of the orthopedic surgeons on the staff at Children's Memorial Hospital. However, as a social worker is not in a position to give an accurate evaluation of medical data, the above tables can only indicate an approximate degree of improvement or lack of improvement. The child who was under treatment for congenital dislocation of the hips was not included in the above tables.

There are two complications of cerebral palsy which must necessarily be included in any study of children suffering with this handicap—those of defective vision and

defective speech. In the course of the staff physicians' efforts to assist one spastic child to the greatest degree, an eye examination was ordered, and this child was found to have a very serious eye defect. As a result, routine eye examinations were recommended on all children under treatment for cerebral palsy. Of the fifty-nine children studied, forty-nine completed the eye examinations. Thirty-five, or seventy-one per cent of this group, were found to have defective vision. In eleven patients, the defect could not be corrected by glasses. Only fourteen, or twenty-nine per cent, had normal vision. Table VII indicates that there seems to be no correlation between the extent of paralysis and the visual defect.

TABLE VII: Results of Eye Examinations

	Hemiplegia	Paraplegia	Tetraplegia	Total
Normal vision	5	7	4	14
Defective vision— no glasses recommended	7	3	1	11
Defective vision— glasses recommended	8	13	3	24
No examination	4	2	4	10
Total	22	25	12	59

Of the ten children not included in the above table, five were retarded mentally to such an extent that the eye examination could not have been performed successfully. The five remaining patients failed to complete the tests.

As the fifty-nine children were not all routinely examined by a speech clinician, the exact number of patients with any degree of speech defect is not known. There were, however, eighteen children with obviously defective speech who were receiving corrective treatment either in the clinic or in school. There were five children in the hemiplegia group, six in the paraplegia, and seven in the tetraplegia group who had obvious speech defects. It should be pointed out that a child with a paraplegia or tetraplegia does not necessarily have any speech impediment, as there were several in this group who spoke clearly. Observations indicate that the spastic child is often slower in learning to talk than the normal child.

RESULTS OF PSYCHOLOGICAL EXAMINATIONS AS COMPARED WITH EDUCABILITY OF THE SPASTIC CHILD

In turning to a discussion of the intellectual capacity of the spastic child, Dr. Bronson Crothers of Boston, whom you will recall as being especially interested in children suffering from this condition, made the following comment in one of his lectures: "By far the most essential point is to remember that motor disturbance and mental disturbance are entirely distinct affairs. Absolute idiocy may exist in a child without motor incompetence and complete disorganization of the motor control may exist in a child with intact intelligence. As a natural corollary of the necessary optimism, workers in this group will distrust diagnoses of mental defect until forced to accept them. In my opinion few doctors and fewer psychologists recognize fully the influence of motor defects upon most of the established mental tests.[1]

It is not only necessary to recall that the usual mental test includes judgment of motor ability, such as drawing, writing, tying bow knots, but that it is partially based upon questions about the environment such as naming objects and giving information as to how two objects differ. A paraplegic or tetraplegic child is not only deprived of a social background gained through every day associations with other children in playing games, conversing and exploring new situations, but is unable to perform some of the simplest mechanical actions expected of a normal child of his age. While a good clerical psychologist is quite capable of giving accurate classifications of children who are normal physically or handicapped in some other manner than by cerebral palsy, he might be at loss to think of new ways to probe into the intelligence of the spastic child, severely handicapped and perhaps having a speech defect. For example, Mary was tested by an individual known to be an excellent clerical psychologist in June 1933, and was given an intelligence rating of 73 (borderline defective). In November 1933, a psychologist with special training tested this same child, and after considerable improvisation of the testing material, obtained a rating of 96 (average intelligence).

The psychologist at Children's Memorial Hospital, who is particularly interested in this problem, spends a great deal of time with each spastic child she tests, and feels that the rating should always be considered tentative. Many of the fifty-nine children in this study were tested by the Child Study Department of the public school system in Chicago, where they are also aware of the difficulty in obtaining a true picture of the mental abilities of these children. In the tabulations which follow, where a child had been tested by both organizations, the highest rating was used. The classifications according to intelligence quotients were made on the following basis: Genius, I. Q. 140 or above; very superior 120-140; superior, 110-120; average, 90-110; dull, 80-90; borderline, 70-80; very low, below 70. Dr. Crother's statement that there need be no correlation between the extent of physical handicap and low intelligence is well demonstrated in Table VIII.

TABLE VIII: Intelligence Rating Versus Handicap

Rating	Hemiplegia	Paraplegia	Tetraplegia	Total
Genius	1	1	..	2
Very superior	..	2	..	2
Superior	..	..	2	2
Average	6	8	2	16
Dull	7	4	2	13
Borderline	4	1	2	7
Very low	4	9	4	17
Total	22	25	12	59

If the above tests were to be accepted at face value, then only twenty-two of the fifty-nine children in this study could be considered as having average or above average intelligence. While the parents, the physical therapists, and the social worker could give illustrations in the activities of several of the twenty-seven children who did not attain the mental test rating of average which would tend to refute the rating given them, there is probably no more convincing proof that the child may be above his rated intellectual level than his response in the classroom.

An outstanding example of a child whose intelligence rating placed her in the "dull" group was Doris, twelve years old and in the fifth grade. She is a tetraplegic child and also has a severe speech defect. Her school program had been interrupted due to illness or for periods of hospital treatment. Yet, at the time of this study, she was in the fifth grade, and her teacher stated that she did average work, was excellent in spelling and even good in writing considering her handicap. John is another "dull" child who demonstrates the hazard of accepting an intelligence rating as final. He was seven and one-half years old, and although paraplegic with a speech defect, he was in the regular grade for his age and was reported to be doing good work in school. John had an additional handicap in that his insane mother cared for him until a few years previously, depriving him of a helpful home environment. Elsie, a case of hemiplegia, who was rated as having "borderline" intelligence, was

1. Crothers, Bronson, M. D., "The Physiological Management of Children Handicapped by Cerebral Palsy:" reprint of the Edith Pool Butler Lecture, Chicago, 1929.

in the fifth grade at the age of twelve years, doing good work in spelling, history and geography, but poor in reading and arithmetic. Robert, also a "borderline" example, is spastic in all extremities, and has a serious speech defect. His rating was qualified by the following remarks: "shows signs of mental development. Response which indicates advanced understanding." He was in the third grade at the age of twelve, but trying desperately to learn.

In the very low group, of which only four of the eleven were considered educable, there was one child whose performance was at variance with her intelligence rating. This child, incidentally, also serves as an excellent illustration of the manner in which some spastic children react to educational efforts. Alice, nine years old and spastic in all extremities, is further handicapped by very poor vision which is only partially corrected by glasses, and she also has a severe speech defect. For three years she was retained in the special room for spastic children at one of the special schools, and the teacher had nearly lost hope of ever being able to teach her anything. One method of instruction was to ask the child to read cards bearing the name of dog, cat, etc. Day after day the cards were presented and identified by the teacher, and day after day the child would be able to rename only one or two of the entire group. One day Alice named off the entire group of cards, with very little prompting and few errors, and from that time on the teacher noted a decided improvement in her ability to respond to new instructions.

Of the group of children who had never attended school at the time of the study, all but six found in the very low intelligence classifications were either too young to go to school, or, as was true in one case, the child was living in a suburb where an educational program had not yet been prepared for him. One other case, the child of average intelligence, lived in the same suburb[1] and had been excluded from the regular school. At this point, it might be well to explain that while there are four schools within certain defined areas set aside for the purpose of educating handicapped children in the city of Chicago, only one has a special room for spastic children. In the other schools, the spastic children are in the regular rooms, and even in this one school, not all spastic children are in the special room. This school also operates a nursery division for spastic children between the ages of eighteen months and six years. While children of nursery school age are accepted from any section of the city, bus privileges are extended only to those living within the specific school area. Therefore, inadequacy of transportation is a prohibitive factor in securing nursery school privilege for many of the spastic children.

The value of early physical and occupational therapy treatment and medical observation and treatment is readily accepted by those persons interested and active in work with this type of handicapped child. For some reason, the urgency for early emotional, social, and intellectual training is apparently not always recognized. The opportunity for the spastic child to learn early in life how to play with other children, to have an emotional outlet, to enjoy social contacts, and to develop proper habits, gives him an immeasurable advantage over the less fortunate spastic child who has been deprived of nursery school education and must try to acquire these new experiences at kindergarten age. A former teacher in the nursery school, in the following illustration poignantly demonstrates the value of the nursery school: J. R., the son of intelligent and capable parents, was carried to school by his mother who instructed the teacher that he must lie on pillows the entire day. In two days he was sitting in a chair, taking part in nursery school activities.

The fact that there is only one school in Chicago with a room for spastic children means that spastic children who cannot do the work in a regular grade in the three other special schools, must be placed in the rooms set aside for the mentally deficient. While the teacher may be most sympathetic and helpful, she cannot offset the stigma which is attached to being placed with a group of children who are obviously mentally defective; nor can she overcome within the spastic child the feeling that if he is in the "special room" he must also be mentally defective. That fact, alone, would tend to discourage his efforts to develop mentally to the best of his ability. Table IX below is a comparison of the intelligence rating versus the school placement and scholarship:

There were only six children in the group of fifty-nine spastics for whom commitment was advised at the time the study was being made. One child, a hemiplegic type, was epileptic as well as feebleminded; two were idiots; and three were classified as feebleminded but were given the advantage of specialized training at one of the special schools before a definite decision was made that they were non-educable. There were other children whose ratings fell in the lower brackets who will no doubt be committed in the future, but not until all possibility of improvement has been shown to be lacking. Perhaps this may be considered as too conservative, but many physicians feel that it is difficult to judge the extent of the ability of the spastic child until he has been subjected to a good environment for a number of years.

Emotional and Environmental Background of the Spastic Child

We have just spoken of "good environment" as being essential to the development of the spastic child, and the fact that his true ability can not be judged unless he has been subjected to this "good environment" for a number of years. What is meant by this term, other than good physical care, and an opportunity to learn? It implies affection, a place in community life, freedom from continual emotional strain, friendships, hobbies, and in-

1. During the course of the study special efforts were being directed toward provision for the education of these two children, and their educational needs were brought to the attention of the school board in the suburb during a special meeting.

Table IX: Intelligence Rating Versus Educability

Intelligence Rating	SPECIAL SCHOOL: Regular School	Regular Grade for Age	Regular grade but below age level: good	fair	poor	Special room: good	fair	poor	Excluded	Never Attended School	Total
Genius	..	1	..	..	..	..	..	..	..	1	2
Very superior	..	..	..	..	..	2	..	..	..	..	2
Superior	..	..	..	..	..	..	..	..	..	2	2
Average	3	1	4	2	..	1	..	..	1	4	16
Dull	1	2	6	2	..	1	..	..	..	1	13
Borderline	..	..	5	..	..	1	..	1	..	..	7
Very low	..	..	..	..	..	1	..	3	7	6	17
Total	4	4	15	4	..	6	..	4	8	14	59

numerable other aspects of everyday living. From the day that the child's handicap is discovered, especially in the paraplegic and tetraplegic children, the spastic child is set apart from the normal family group. The very nature of his handicap prevents him from joining, as an equal, in the life that goes on about him. He becomes an "onlooker." When he has intelligence approximating normal level or above, he is keenly aware of his handicap and is sensitive to the point of withdrawal from those social contacts which are available to him. To a lay person, a severe spastic is a sad sight, with his tottering gait and often silly-looking smile and hampered speech, and he is frequently pitied, or worse, looked upon with a mingling of disgust and horror. Virgil Hafeli, a spastic boy in the Elias Michael High School in St. Louis, wrote an article for the *Crippled Child Magazine*, entitled the "Spastic Must Find Himself."[1] In this article he speaks of the spastic child discovering early in life that he is different from others and that he "hides himself from the gaze of the curious." This early recognition of the radical difference from those about him, makes the spastic child feel insecure and tends to destroy the little confidence he may have in himself.

Faced with the problem of adjusting in a world of normal people who often reject him at first glance, with the desire to express himself clearly inhibited by a speech defect, with the craving to take part in activities which he is either entirely unable or too clumsy to perform, he is frustrated countless times in his every day life. To his parents falls the task of attempting to adjust him to these disappointments and unwholesome personal reactions. If the parents fail, the child becomes emotionally unstable and his possibilities for intellectual development are often endangered. Parental attitudes must be constructive in order to effect the best possible adjustment of this spastic child to his life.

The expressions of emotional reaction upon the part of the parents toward their spastic child when they first brought him to clinic were varied: a few came to find out where he might be "put away"; many came to have him "cured" and when they were informed of the nature of the handicap, broke down completely, feeling that the situation was hopeless; those who knew the diagnosis when they came to clinic, or who had had educational and environmental advantages sufficient to help them understand their problem, were eager for treatment and words of encouragement. As the worker grew better acquainted with the parents (in most instances this was the mother), certain definite attitudes were noted: there were those filled with self-pity who felt "life" had wronged them by giving them a spastic child; there were others who presented definite feeling of guilt, and for this reason practiced over-indulgence of the child. These mothers would sooner or later draw the worker into their confidence to give the reason for their feeling of guilt—an attempted abortion, for example. Others were over-indulgent because they were seemingly repulsed by the child and wished to overcome this feeling by doing more than they actually needed to do. Still others were filled with shame, to have borne such a child, and were constantly reminded of this feeling by well-meaning neighbors and relatives who expressed their pity to the mother. There were mothers who tried to trace the child's condition to venereal disease or heredity in either the maternal or paternal history. There were also mothers who had already mastered their outward emotional reactions, had accepted the child's condition and were ready to do anything which could improve his condition to the slightest degree. These latter ones, of course, were the exception.

It is evident from these fifty-nine cases that the mother was sufficiently stunned in many instances by having had a spastic child to inhibit the desire for other children. In thirty-one of the families, the spastic child was either the only child, or the last one born. A former teacher of the nursery school also found that many of her children were "only" children.

In an attempt to assist the parents to gain emotional control and to attain the greatest degree of co-operation in the medical, physical therapy, and occupational therapy program, the social worker's first step was to explain the possible cause of the handicap and to outline the treatment program which could be made available to the child. With the slightest improvement in the child's physical condition, the worker noted that the parents gained confidence and showed greater amenability to suggestion. As the child gradually improved, the parents seemed to become more and more actively interested in treatment and were often of valuable assistance by way of inventing devices for their child to use in his play which were especially beneficial in overcoming his handicap.

According to the individual problem presented, efforts were made to shape the parents' attitude toward the child. For example, the mother of Peter cried almost continually in his presence. Peter was an unusually attractive little boy, of the paraplegic type, and the mother could not seem to overcome her sorrow that this "beautiful child" could not use his legs. She carried him about, hovered over him, anticipated his every need. In turn, Peter was very shy, withdrawn, afraid to try to help himself. It was several months before she could be convinced that she was actually impeding his progress. It was later possible for her to provide transportation for him to the nursery school, but she was afraid to put him in the care of others as they might not "understand" him. She finally agreed to send him and gradually acquired a helpful attitude toward him.

David's parents differed radically in their attitude toward him. The father was militaristic, impatient, and tried to force the child beyond his ability, and the mother was over-protective. David, an only child, was quarrelsome, cruel and defiant in his relationships with the other children in nursery school, and demanding toward his mother.

Sally lived with an older sister, mother and maternal relatives. She was pampered at home, and the other children had to give in to her because of her handicap. In school she had considerable difficulty in making an adjustment, but this was finally effected after the teacher and the social worker explained the problems in detail to the mother and relatives, who were intelligent persons interested in helping Sally.

The belief that emotional strain in the home creates extreme tension in the spastic child, was borne out in a study made by one of the physical therapists at a special school. She observed a small group of spastic children whose families were receiving relief. When there was anxiety and discomfort at home because the food supply was exhausted or the coal had not arrived, the child would come to school so tense, physically as well as mentally, that the day would be over before he could regain composure sufficient to obtain any beneficial results from either the educational or physical therapy program.

Violent outbursts of "temper" on the part of the spastic child were reported by a large number of the mothers, and were traced in the main to frustration following the child's attempt to carry out some form of activity. The mothers were cautioned to treat the child

1. The Crippled Child Magazine, December, 1932.

calmly during these outbursts, and it was explained that speaking harshly or slapping would intensify the outbursts and promote frequency of recurrence. Many mothers also showed a tendency to "nag" the child because he ran, and then fell, or "played too hard." This was also discouraged on the basis that the child was being constantly reminded of his handicap.

In the fifty-nine cases under observation, the homes were analyzed and classified as "good," "fair" and "poor." A good home was one in which the parents seemed to have an intelligent understanding of the child's problems, physically, mentally, and socially. For example, both of Paul's parents were keenly interested in bringing about improvement in their spastic child. The father built several devices such as a walker and a very protected junglegym which he taught the boy to use. The mother always permitted Paul to feed himself, although this procedure required over an hour. She had thought out the situation so thoroughly that she not only planned her work to be in or near the kitchen while he was eating (so that he would not be conscious that it was necessary for her to watch him) but she spread papers on the floor around the table, thereby avoiding the need to wipe or sweep the floor after his meal and remind him of his inability to eat properly. Another mother in this group was instrumental in helping her spastic boy to gain control of his hand by interesting him in the piano. The child was not a good musician, but he enjoyed practicing. She endured many an hour of very poor music, making encouraging remarks and offering praise, in her effort to improve his condition. A third mother, whose child has a severe speech defect and was paraplegic, has taught the child to say over one hundred words distinctly; while the father has improvised a bicycle and has built several pieces of small apparatus for use in the house. There were forty-one homes which were evaluated as "good."

The twelve homes evaluated as "fair" were those in which the parents were eager to help the child but through ignorance, over-indulgence, or excessive worry, handicapped him to some extent. One mother, for example, "reported" the child regularly to the worker in his presence, giving detailed descriptions as to how he ground his teeth at night, insisted on running when he knew he would fall, and relating any of hi[illegible]r outbursts. Peter, who was described previously, was also an example of a child in a "fair" home because of his mother's over-protection and frequent tears. There were only six homes which seemed to belong to the "poor" classification. The most outstanding case in this group was the home of a six-year-old boy with a hemiplegia which would have had a good prognosis if proper treatment could have been carried out. The mother was insane, but had been returned to her home during a period of improvement. The father was in his seventies and in poor health. The mother refused to allow the child to go to school; would not permit the Visiting Nurse to enter the home and give him exercises; and, to further impede his progress, she was his constant companion, carrying on incoherent conversations with him to the point where the child imitated her talk and actions. Another home, that of a little girl with a severe spasticity, was one in which the mother was ignorant and superstitious. She permitted the child to go to school and to be observed in clinic for supervision of physical therapy, but she refused any other form of medical treatment, including an eye examination.

Conclusion

In a final evaluation of these fifty-nine cases, certain definite conclusions were formulated. It is hoped that these conclusions may be of value to other persons interested in adequate facilities for the training and medical supervision of spastic children:

1. That a program of surgery and physical and occupational therapy will bring improvement in many instances.

2. That the home conditions of the spastic child are an important factor in his personality and physical development. As this type of child is all too soon aware of the marked contrast he presents to the normal person, discouraging parental attitudes will increase his emotional instability and lack of self-confidence to such a degree that his response to the program created for him by the community will be greatly inhibited.

3. That all educable spastic children should be given the opportunity for nursery school, not only because specialists in the field of teaching spastic children can be of great assistance to the parents in assisting them how to train the child, or because they are able to develop the child's learning ability at an early age, but also because the spastic child is given an opportunity for companionship with other children, in the true sense of the word, as he will be a "participant" rather than an "onlooker."

4. That, contrary to general opinion, a person with cerebral palsy is not necessarily mentally deficient, and that the emotional, environmental and physical make-up of the spastic child is often prohibitive to giving a true interpretation of his mental ability. Caution should therefore be extended to weigh all factors carefully before commitment to a state institution for the feebleminded is encouraged.

Tri-State Hospital Assembly

Last year, the Tri-State Hospital Assembly met in Chicago, and the Chicago and Wisconsin Chapters of the American Physiotherapy Association took some part in the program. It was a successful venture, and a helpful one. The question stressed was that of hospital physical therapy equipment.

This year, the meeting will be in Chicago again, at the Hotel Sherman, and the program this year will stress education in physical therapy. Again, the Chicago and Wisconsin Chapters are working together on the physical therapy program. The meeting of the Tri-State Hospital Assembly will be on May 6, 7, 8.

Evaluation of Patients from the Mental Hygiene Point of View

Maud E. Watson, Ph. D.

The first thought that occurred to me in reading over the program was,[1] "How far we have gone in the past ten years in our thinking that we can afford to set up a program which is centered around the personality of the patient and his attitudes toward illness." Does it indicate that we now realize there is often a balance between the physical and psychogenic factors in illness and that to treat patients effectively, whether we be physicians or professional social workers or psychologists, this must be taken into account? Surely we have a realization as never before that illness may be of physical or psychogenic origin and that in either case the patient is a "sick individual" and needs treatment and consideration none the less. To the more intelligent technician, as a patient this individual is no longer "pigeon-holed" as a neurotic, a psycopath, or a general nuisance who has a beaten path to his physician's door or to one clinic after another, not finding the emotional satisfaction for which he is seeking, turning to various so-called cults and unscientific cures or going about a miserable, conflicted, unhappy person shunned and disliked by those with whom he comes in contact because of his never-ending complaints. To term such an individual as just another "neurotic" belies our adequacy to handle such problems and gives us a good term behind which we may defend ourselves.

No, our modern point of view is quite different. We start examining the life history of the individual, and his mechanisms growing out of these experiences. We begin further to examine and interpret carefully his symptoms—symptoms to which he struggles with so much difficulty to cling, so that he will not have to face his own conflicts growing out of his own deprivations and frustrations—a situation deeper down which he cannot apparently bear to face. Why is there a symptom of headaches in this particular case, in another nausea, in still another pains in the gastro-intestinal region, and so on, each individual with a complaint or combination of complaints—but always his own complaint used by him for a particular unconscious purpose. What does he wish from his physician? An understanding, parental substitute, infantile in his reactions to be sure, but conflicted, unhappy, and afraid. Afraid of what? Most of the time he is quite unconscious of the cause of his own fears and deep-laid anxieties.

Repressions in the unconscious are familiar and some of us view them, happening in our day by day life in a simpler way, with some humor. Who of us as social workers, in interviews when we are irritated beyond words and denied an opportunity to give vent to some form of words and explosiveness, have not found ourselves suddenly seized with violent coughing or hoarseness—an acceptable conscious form of behavior to our listeners and ourselves in place of a temper tantrum that is taboo and not expected of us as professional workers. What lecturer on mental hygiene has not witnessed the same reaction in a class when the subject of religion or sex is touched upon too clearly or truthfully for some students to accept? Resistance in coughing is acceptable, but hardly walking out of the room to be gazed upon by the rest of the group as well as the keen-eyed instructor who sees beneath the surface and realizes the need of the student to escape.

Physical complaints without an organic basis may be then conversion mechanisms—the conversion of emotional conflicts to gain sympathy and understanding for the patient who can gain these in no other way.

But is that all the story? The average individual has learned to "ignore a great deal that would otherwise disturb him profoundly." In other words, "recognition of whatever tends to arouse conflict is shut out from the conscious awareness and so there is a respite from what many of us term "intolerable tension." Discipline, education, and definitions of situations in social groups have tended to develop a technique of repressing emotions so that most of us go through the wear and tear of the day without too much conscious disturbance. Karin Stephens has said rather aptly in her book, *Psychoanalysis and Medicine*, "The price we pay for emotional stability and the escape from suffering, which successful repression brings emotional impoverishment —since repression cannot solve conflicts but can only shelve them!" Undoubtedly true—but the neurotic who is our problem repeatedly in clinics is the individual whose impulses and desires are denied open gratification and who eventually gets his satisfaction only in displaced and disguised ways, sometimes in fears, anxieties, compulsions, and numerous physical complaints without an organic basis. To understand him we must know step by step his life experiences, his frustrations and drives in meeting these experiences. As we study case after case we see him emerging clearly from his year by year experiences and just so clearly do we see his hates, frustrations and inferiority feelings clinging to him, until no longer able to face life and its realities, he takes refuge in illness, a sick individual emotionally if not actually physically.

To treat him if he is intelligent is to help him become aware of his life experiences and what they have actually meant to him in feeling values. Notice I said "help him to become aware," not tell him. The very things we attempt to tell him may be too painful for him to accept so he turns a deaf ear upon our words of advice or interprets what we have said according to his own emotional needs—a protective mechanism essential in his present upset emotional state. I am always amused by young workers who are frequently disturbed by patients who misinterpret physicians' instructions or their own words of "wisdom" given out as advice. Recently a mother told me with much emphasis three times in succession that her pediatrician had told her that her son must be given sedatives to sleep, the pediatrician having called me an hour previously saying all sedatives must be discontinued. I was not surprised at her interpretation because she had early in the interview told me that Dr. G. had told her that she was a "poor mother" and her son's illness was her fault. How could she

Director, The Children's Center, Detroit, Mich.

1. Given as one of a series of Lectures before the Medical Social Service Association, Detroit, Michigan.

accept any of his instructions so preoccupied was she with his reprimand closely tied up with a quarrel the previous night with her husband, who in an outburst of anger had told her the same thing and threatened to leave if she continued her over-protection?

Children and their neurotic reactions are particularly interesting because so often their frustrations and desires are more apparent in relation to the adults who surround them, especially their parents and teachers who dominate their days to a high degree.

Even in very little children it is not uncommon to see neurotic reactions; for example, in facing school for the first time, in vomiting attacks as a defense or perhaps later, as school becomes a more difficult reality, fainting attacks which serve to gain for the time being a release from a situation which they cannot face.

One of the most interesting children I have known is a very superior little girl, Mary, aged six, referred by the school and her pediatrician for frequent vomiting spells in school and refusal to go in the morning. She is an only child with maternal and paternal grandparents who over-protected and almost suffocated her with love and affection. In kindergarten she met competition with thirty-five other children and little attention from her teacher, a reality situation with which she could not cope. A long process of treatment with parents, grandparents, Mary, and the school has resulted in a little girl friendly to other children, no more refusal to go to school, and no more vomiting spells. A recent remark from her indicates her awareness of the situation. "Wasn't I silly to be afraid of so many things (meaning teachers and schoolmates), but I am not any more—a baby and afraid to go to school alone. I even go to dancing class and a play (dramatic) club." Her last important step was to refer another little girl in school who is also "afraid and a baby" to her "friend," The Children's Center, volunteering to take her down the first time.

What we can do with children who early display neurotic reactions to avoid more deep-seated involved problems in later adulthood is yet to be seen. Certainly we have a little clearer understanding of children through their play, their stories and drawings but we have far to go in interpreting accurately their phantasies, hates and early frustrations.

How often as I see children, I wish I really knew what they meant when they speak, play, write their stories, or draw pictures. Too frequently their play is but reliving their experiences of the day. Sometimes long before I see the parents I have a perfect picture of them through the simple game of "playing house," providing I am a passive enough mother person who does not need to be the leader but can be told to do what my little patient dictates.

Several months ago I drew pictures with a little seven-year-old lad who created a home with a father and mother and a large dog. Every time I tried to introduce a little brother into mine, he stamped on the paper or scribbled it over then fearfully looked at me as if I would punish him. Finally I returned to his picture, saying, "What is your dog's name?" He replied, "I ain't got a dog. All I got is a brother," and, under his breath, "the little pest." (Such English coming from a professional family.) He had been sent to the clinic for regressive behavior, soiling his clothing, and refusal to eat. When I asked the parents how he got along with his little brother, they assured me that they got along beautifully, never quarreled, etc. You know how wishful we are about family relationships—no quarrels, no friction, always happiness. But here was your story completely told. The reasons for such feeling came through gradually. Heretofore, Jack had been the center of attention of six admiring adults, now he had lost his place in the sun two years previously. His mother was rushed off to the hospital to come back with a toothless, bald-headed, unattractive baby, which was bad enough, but to have to go to school for the first time and share a new mother substitute there with thirty-six other competitive brothers and sisters whose desires were as great as his, was too much. He tried temper tantrums to no avail, so he became a baby once more himself—wetting and soiling and demanding special kinds of food which he obstinately refused when offered. The parents were asked, "Did your little son know he was going to have a baby brother?" The mother said, in some surprise, "Of course not, he was too young." Too young—I wonder, when I see the months that have been put in with the combined efforts of all of us, including the parents, to get him to accept one whom Jack still considers an intruder. He has the long dreamed of dog, and, funny enough, the name selected was "Buddy," his brother's nickname, but neither the parents nor baby brother can touch him without, "You let him alone, he belongs to me." His animosity outside the house toward small children is already plainly seen. He pinches, pushes, and slaps them.

The child looks for love, security, recognition, new experiences as well as physical care in his home. What we are all understanding more clearly than ever before is how difficult it is sometimes for parents to give any one of these, let alone all, when they are hard pressed by their own conflicts and how much these same conflicts damage the lives of their children.

The neurotic patient is of interest and always will be because of his baffling behavior. Closely akin to the neurotic is the slightly mentally ill patient too near normal for hospitalization but a burden to the social worker who often does not understand his mechanisms clearly. He is the prolific letter writer over fancied wrongs, paranoid and unliked, well known to charity organizations and clinics, or the maniac depressive patient, elated, in a period of activity, spending money foolishly, involved in many sexual activities, boastful, refusing to keep a job longer than a short period of time, but again not too elated nor disturbed for hospitalization. What a pity that we cannot learn to recognize these mechanisms more quickly, understand them, evaluate our patient and not expect of him what we do of a mentally healthy individual. Our energies are so often ill spent on such a patient to say nothing of the damage we do to him. He is to be carefully handled, knowing where his weaknesses lie, and at no time should too much pressure be put upon him for fear of disrupting him entirely. Kindliness and understanding with treatment and supervision under the watchful eye of a good psychiatrist are all we have to offer. Why try to make him over, with a blind resistance to what he really is? And what about the energy we use as social workers on the feeble minded or dull normal adult. How we laugh at ourselves as we look back at our youthful enthusiasm in our attempts to endow him with normal intelligence and make him behave as a normal human being, assuming responsibility in work and for his family of six or seven children which his poor confused mind, more confused by our persistent efforts, could not possibly puzzle out. A simplified routine situation, with positive constructive suggestions simply put, and ourselves in the background as good parental substitutes sharing his responsibility, are the most effective

technique. Why do we wishfully attempt more? Our efforts can well be spent in helping the feeble-minded boy or girl in the family into a suitable institution or educational situation so that he may be trained to some understanding of his own limitations to do simple routine tasks later in the community with some effectiveness and security within himself so that he will not take on destructive behavior such as delinquency.

Nor can we pass by the emotionally involved patient with conflicts too deep to be touched except by psychoanalysis or perhaps not analyzable material at all. Merely talking and pouring out symptoms bring relief only for the moment. It may mean some emotional satisfaction to the social worker who listens endless hours but I doubt the wisdom or value to the patient. Here is where an interview limited to a certain number of minutes, regularly given to the patient, a time he can depend upon as his own, is of some value for it offers a kindly, friendly interest of which he is so much in need. Do not, however, let your enthusiasm carry you on to believe that you will reconstruct his behavior, for his problems are too fundamental to be touched. Your assistance at best is only palliative but will be of the greatest value on a superficial level and may keep him going effectively in the community for some time to come.

And last, is the immature individual who objects so strenuously to our authority. Whatever job we suggest, he refuses—a symbol of his resistance to us as well as his unresolved conflict with parental authority in his childhood. He changes appointments or does not come at all—resisting us often, or refusing to disclose material in his own life which he is not yet prepared to face. He, too, frequently punishes the worker by saying that she has been of no assistance. Sometimes he gains access to the supervisor for the same purpose or to the doctor to whom he complains bitterly of the worker. How much more comfortable to understand these patients, accept them for what they are, and save our most constructive efforts for patients whom we can help and who are reaching out for our assistance. And what patient is he—some of you are asking? He is the intelligent individual who is fairly well adjusted on a conscious level at least; has some awareness of his own problems and is unadjusted for the moment because of physical illness or economic stress. To him should go our best efforts so that he may escape later emotional scars from lack of assistance when in his dependency he most needed our help.

It is impossible to go on with this paper without saying a few words about the children whom you meet as patients in your daily routine. It is unnecessary to mention the fact that you no longer regard the patient as a mere physical presence with an illness, but that back of every patient is his life experiences and growing out of these is his own personality needs. Illness to a mature adult is a threat to his ego, therefore, he takes the business of getting well seriously, comments as little about it as possible, carries out the instructions of physicians, and is soon well again. The adult with whom we are all concerned is the individual who has the need to regress too far when he is ill, for illness brings a sense of helplessness and dependency such as were experienced in childhood and the physician becomes for the moment a parental substitute. This is one of the reasons why the child should be handled so carefully during a sickness. It is the one time when he gets attention from his parents who may have, up until his illness, put him fairly on his own responsibility, but out of their own insecurity and fear as to the probable outcome they begin thrusting attention upon him until he finds it much pleasanter to prolong his invalidism rather than to meet the reality of the day.

As one works with children one is impressed with the fact that the most careful preparation from an emotional standpoint must be made for every operation, and for various laboratory tests that are essential if we wish to avoid the appearance of destructive symptoms of behavior long after the operation is over; for example, fears, regressive behavior, etc.

Who has not seen children reliving the experience of a tonsilectomy by operating on their teddy bears or dolls? At first, this seemed rather humorous, now we have a different realization that these operations may be performed time and time again until the traumatic experience is completely obliterated.

What physicians in white coats and shining instruments, stripping children against their will, mean to the child can only be ascertained by the number of youngsters who are sent to Child Guidance Clinics after prolonged illnesses with symptoms unrelated but nevertheless having a direct bearing upon their handling during the long period of sickness. White coats and instruments and anaesthetics may mean little to the mature adult, but to the child they are something fearful and unknown, and a youngster must be adequately prepared to recognize them and know in a simple way the results of such operations if we are to avoid trouble in the future. Particularly are we concerned with the child with neurotic reactions when we see in adult clinics the number of patients with functional illnesses looking for a parental substitute, with physical symptoms which are a protective mechanism and mean only that to take these symptoms away the patient will be plunged into something he cannot face. To tell the child that he can walk, if he is a case of hysteria, that there is nothing wrong with him, or to become impatient with him with his attacks of nausea and headaches when he cannot face a school situation, for example, is but building difficulties for the future and brings about no effective cure. The child does not respond to treatment any more than the adult unless he has some understanding of the mechanisms that are operating underneath and are causing his so-called illness.

Recently I have watched with a good deal of interest a youngster, eleven years of age, bent almost double to an intra-uterine position, unable to walk, seen by sixteen different physicians, with varying diagnoses from tubercular meningitis to arthritis. Finally he fell into the hands of a very intelligent pediatrician who, not locating any organic basis for his difficulty, sent him to be studied, to discover the real reasons why he could not walk. An over-protective, dominating mother, a fearful father, a long history of masturbation with various kinds of punishment, have caused tremendous fear in the child and it has been of interest to note that, as he has been relieved of his guilt concerning masturbation, as he has an understanding of his competitive jealousy with two younger sisters, and his frustration with his mother, he has straightened up and begun to walk a little within a period of two weeks. Easy enough it is to clear up these symptoms for the moment, but the problem with which we must concern ourselves is a deeper study of his reasons for throwing up such a mechanism and what the future holds for him when he meets a new situation to which he is unable to adjust.

We have gone far in the past ten years—we shall go farther as social workers in the next ten years unless

unhappily we become blinded by our own prejudices, are inflexible, and shut our eyes with determination to an ever-widening horizon of newer ideas and interpretations of patients and what they hope unconsciously to gain from illness.

One subject just opening and for the most part almost untouched is the patient who constantly seeks surgical operations. We grant that hysterical patients can produce symptoms which gratify the patient's unconscious need to be punished or punish a member of his family by whom he is particularly frustrated and from whom he wishes solicitude. Surgeons themselves are becoming aware of this, particularly of women who are constantly seeking operations in the field of gynecology.

A second field of interest to us and still undiscovered to any great extent is the whole field of accidents. Here unconscious motives play such a large part even in children's accidents that we are sometimes completely startled. A need to punish or be punished comes out so clearly at times in utterances as the child is coming out of an anaesthetic that one is readily assured of unconscious reasons. Effectiveness of physical treatment in accidents so often depends upon the patient's attitude toward getting well that the understanding of unconscious motives is becoming more and more essential.

We shied away not many years ago from the underlying emotional reasons for alcoholism and desertion, and treated blindly on the surface. To point out to you today that alcoholism is symptomatic of the individual's need to be dependent, to escape the reality of a situation which he cannot face or to make him feel more adequate for the time being, is a waste of time; or to give you the emotional implications of desertion is offering you a second insult. You are as aware as I of the connotations. Just so we shall become more and more aware of the hidden significance of much of the behavior we now see in illness. We shall see it only, however, if we are unafraid to face ourselves and our own behavior. Resistance to facing new and sound ideas is too frequently a fear of our own unconscious conflicts, competitive strivings and a fear that we may be slipping professionally, so we hold fast to known standards and refuse the new. Objectives, critical, analytical thinking and a willingness to learn can alone keep us in the vanguard as professional social workers and a real aid to the other professions with which we come in daily contact.

A Physiologic Basis for the Treatment of Mastitis Adolescentium

Frederic T. Jung, Ph. D., M. D.

Among the various conditions of the breast that can bring the patient to the doctor is a curious swelling found under the nipples of boys and girls early in adolescence. It is likely to develop quite rapidly on one side and may be disagreeably tender. Since it is accompanied by very little, if any, hyperemia, no feeling of warmth, and no signs of either secretion or pus, it is not really an inflammation, and the name "mastitis" is in this respect a misnomer. It rather suggests a neoplastic growth, so that patient and relatives are alarmed by the thought of possible cancer. The phenomenon is of great interest to physiologists since, as will be seen below, the situation concerns not merely the externally secreting mammary gland but the remote glands of internal secretion as well. It is, however, of even greater importance to those called upon to minister to such patients.

Nature of the Swelling

The literature on the nature of this swelling goes back nearly a hundred years to work done by Albers and by Cooper, who are both quoted by Stümcke in a publication dated 1847.[1] They concluded that it was not an inflammation but a stage in the normal development of the mammary gland in boys. The microscopic changes were reported by a number of French authors, and are summarized in a more recent and accessible paper by Zappert.[2] Adler[3] reported the microscopic findings in the case of a boy in whom the painful mass was removed surgically (without injury to the overlying nipple) first on the left side and a few months later on the right side. These findings were essentially a hypertrophy—an extension of the milk-passages and a proliferation of the dense connective tissue about them. Others report some hyperemia and round cell infiltration.

When palpated, the swelling is generally found to be due to a circular (sometimes nearly spherical) mass with definite borders and a diameter of 1 to 1.5 cm. Stümcke saw one painful mass four and one half inches (4½ Zoll) in diameter; this is of interest since in two different places he states that all of the cases observed by him made a slow, complete recovery. There is no discharge unless it has been induced by scratching or by irritating applications.

Etiology

Among the conflicting theories as to etiology, two are of interest chiefly because they are diametrically opposed. Franck[4] elicited a history of masturbation in two boys who had mastitis adolescentium, and suggested that the latter must be caused by the former. Acting on this belief, he "represented the disease in the blackest colors as a consequence of masturbation, and explained that the breast would ulcerate if the boy did not give up this vice." Zappert, on the other hand, quotes a number of authors who believed that the mastitis could be the result of insufficient sexual activity. This idea has the support of facts recorded by Stümcke and by Laurent.[5] It might be added that Franck was led to his belief by his surprise at the size of the external genitalia of his two patients. Examination of a sufficiently large number of boys at this age shows that an especially rapid growth of penis and scrotum occurs regularly during pubescence and cannot without further analysis be correlated with autoerotic activity.

Northwestern University Medical School, Chicago.

Stümcke believed that mastitis adolescentium was limited to the male sex and had its only counterpart, possibly, in localized swellings within the breasts of menstruating unmarried young women. This mistaken impression of his is explained by the remarkable finding of Zappert that the mastitis adolescentium of girls occurs so early that it is practically dissociated from the other phenomena of puberty. This is shown by the tabulation of the cases of Zappert, Franck, Adler, and Laurent. (Table 1.)

TABLE 1

	Girls	Boys			
Age	Zappert	Zappert	Franck	Adler	Laurent
8	1	..	..	..	..
9	..	..	..	..	..
10	1	..	..	..	..
11	9	..	..	..	..
12	2	..	..	..	..
13	1	..	..	..	..
14	..	1	..	..	..
15	..	..	1	..	..
16	..	1	1	1	..
17	..	..	..	..	1

All of the girls examined by Zappert had the infantile habitus and showed no signs of approaching puberty. After the painful swelling had persisted for many weeks, the breast returned in nearly every case to its infantile state; only in one case did a hypertrophied prepubertal breast pass without a distinct interval of regression into the next stage, that of the developing virgin breast. It will be noted that the age of maximum incidence of this swelling in girls is eleven years, while for the boys of this series it is five years later.

OTHER CHANGES OF PUBERTY

A thorough study of some physical and mental changes of puberty were made by Crampton.[6] The appearance of the pubic hair is accompanied by an acceleration of growth both as regards weight and height, and if a group of boys aged fifteen are sorted out into pre- and postpubertal groups by this criterion a distinct difference, in favor of the postpubertal group, is found as regards proficiency in school work. Other changes involve the distribution of hair on other parts of the body, the pitch of the voice, the size of the genitalia, and various genital phenomena such as nocturnal emissions with dreams.

Since it seemed essential, in attempting to explain mastitis adolescentium, to time its incidence in relation to these other phenomena of puberty, Jung and Shafton[7] made a study of a series of normal boys. All were examined for the occurrence of swellings under the nipples, as judged by palpation. The size of each subareolar node so found was stated in arbitrary units from 0 to ++++. Two facts were established: (1) Every boy in the 15.75 and 17.5 age-groups (fourteen boys) had a distinctly palpable node under each nipple. (2) In the 14.25 age-group (twenty-two boys) the nodes were not yet invariably present, but the incidence of ++++ nodes was maximal. The most marked enlargement was seen in a particularly sturdy-looking boy of fifteen years, five months. One boy, aged fourteen years and ten months, also somewhat better developed than the average of his age-group, had a ++++ node on each side and said that they had been painful for about two months.

In addition to the non-quantitative estimate obtained by palpation, however, more quantitative data were obtained by the use of a special instrument for measuring the height of the nipple above the surrounding skin. The results are shown in Chart 1, in which the average amount of pubic, facial, and chest hair are seen to increase rapidly with age between thirteen and fifteen. The

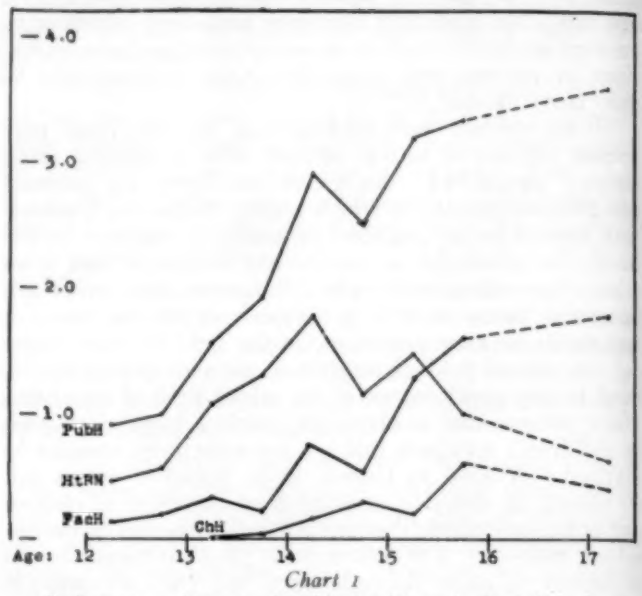


Chart 1

Ordinates: Amount of pubic, facial, and chest hair in arbitrary units. HtRN = height of right nipple in centimeters.

course of the axillary hair was not charted because it so nearly coincided with that of the facial hair.

In this chart it is seen that in the midst of this period of rapid change the nipple reaches its maximum height. This occurs in the 14.25 age-group, in which the incidence of ++++ nodes was highest. Correlation of these various facts enable one to deduce a hypothetical history for the individual node. It probably grows rather suddenly, from a structure too small or too soft to be felt, to a ++++ node; it maintains this size, as a rule, somewhat longer than six months and is likely in a certain percentage of cases to be tender during this time; then, during a period of at least two years, it declines through the +++, ++, and + stages. Other correlations show that the change of voice and appearance of pubic hair most commonly, though not always, precede the attainment of the ++++ size by the subareolar node.

SIGNIFICANCE OF MASTITIS ADOLESCENTIUM

The inference seems justified that actually painful subareolar swelling occurs much more frequently than would be suggested by the number of patients seeking medical advice about it. The data presented lead to the conclusion that a certain degree of mammary hypertrophy is a regular accompaniment of puberty.

This suggests that an endocrine explanation must ultimately be found, though this seems impossible in the present state of our knowledge. If it is safe to assume that the phenomenon reported by Zappert in girls corresponds exactly to that seen in boys, then neither the ovary nor the testis can be essential for its occurrence. It is even unlikely that the testes exert any inhibitory action on the development and functioning of the mammary glands, for both gynecomastia and lactation in men can occur in the presence of functioning testes, and castration is not one of the necessary preliminaries for producing lactation in male experimental animals. According to Riddle[8] the lactogenic hormone from the hypophysis is not capable of causing mammary development: some other, unidentified factor, which probably comes likewise from the hypophysis, is responsible for the changing of the infantile breast into the adult female breast. If, in addition, a third hormone must be postulated in order to explain the prepubertal mammary hypertrophy in girls

and the mid-pubertal mammary hypertrophy in boys, the source and nature of this third hormone invite investigation.

While a nervous explanation is not excluded, it seems less promising than the endocrine. The painstaking work done in the past on the innervation of the mammary glands has not yielded gratifying results. The intercostal (spinal) nerves were found not to be important, and the influence of the sympathetics is not clear. Cannon[9] had two female cats and one female dog that had litters some time after removal of the sympathetic trunks and ganglia. He states that "the functions of lactation seem to be impaired, for the breasts do not develop fully and the young have difficulty in securing adequate nourishment." However, the assumption of a nervous causation of gynecomastia and other mammary disturbances has not proved useful as a basis for therapy.

Summary

The findings here reported accord with the older clinical opinion that mastitis adolescentium is, in general, a transient though occasionally painful stage in the normal development of the mammary tissues. None of the reports studied indicate that any kind of treatment hastened the spontaneous regression of the swelling. Since the condition is not an infection, there is no indication for measures intended to produce hyperemia. The conclusion seems justified that any treatment given should be designed to protect the organ against trauma and to forestall other applications or procedures that might be irritating.

References

1. Stümcke. "Ueber zwei Formen von Mastitis der Kinder." Journal für Kinderkrankheiten 9:406-411. 1847.

2. Zappert, J. "Ueber die akute schmerzhafte Brustdrüsenschwellung grösserer Kinder (Mastitis adolescentium)". Zeitsch. f. Kinderheilkunde 4:353-364. 1913.

3. Adler, R. "Mastitis adolescentium." Deutsche Mediz. Wochensch. 27th year, no. 5, p. 72. 1901.

4. Franck, E. "Beitrag zur Genese der Mastitis adolescentium." Deutsche Mediz. Wochenschr. 27th year, no. 11, p. 169. 1901.

5. Laurent, "De la mammite des adolescents et des adultes." Gaz. méd. de Paris. 1889. (Quoted by Zappert.)

6. Crampton, W. C. "The influence of physiological age upon scholarship." The Psychological Clinic 1:115. 1908.

7. Jung, F. T., and A. L. Shafton. "The mammary gland in the normal adolescent male." Proc. Soc. Exp. Biol. Med. 33:455-458. 1935.

8. Riddle, O. "The lactogenic factor of the pituitary." J. A. M. A. 104(8):636-637. 1935.

9. Cannon, W. B. "Functions of the sympathetic system in maintaining the stability of the organism." Proc. Institute of Med. of Chicago 7(17):229-231.

Physical Therapy in Constipation

Richard Kovacs, M. D.

A fairly large variety of physical therapeutic measures, with well studied physiological effects, serves as an important aid in the constitutional as well as local treatment of chronic constipation, and hence no general therapeutic presentation of the problem can be complete without the consideration of physical treatment agents.

Clinicians have come to recognize that each case of constipation is a clinical problem itself. Constipation may be only a symptom accompanying a pathological condition of the gastro-intestinal tract, or it may be the direct outcome of incorrect habits or living conditions. From the therapeutic standpoint it has been found practicable to adopt a general classification into atonic and spastic types; this classification also serves as a convenient guide in the consideration of rational physical therapy.

Atonic Constipation

The atonic type of constipation which is by far more frequent is characterized by weakness of the large intestine; this may be brought about by many factors, among them bad habits of eating, neglect of the urge of defecation, congenital weakness of abdominal muscles, weakening diseases. In its management, general hygiene, diet, judicious medication and mental treatment are effectively aided by physical agents exerting general and local stimulation. Among these agents belong massage, exercise, low frequency electrical currents.

Massage. This is the simplest and most readily available stimulative measure in the treatment of constipation. When applied to the abdomen its main effect is to increase the tone of abdominal muscles and to bring about increased peristalsis by reflex action. No amount of massage can actually move the abdominal contents; neither can the massage have much effect on the tone of the intestinal musculature and of back and pelvic muscles; hence in cases of real ptosis and relaxation of the pelvic floor more effective forms of stimulation must be employed.

In carrying on abdominal massage it is far from necessary that it be vigorous or prolonged. Slow and gentle movements applied at a rate of about twelve a minute and with a pressure only to dent the abdominal wall are sufficient. The patient lies relaxed on a low couch and gentle rythmical stroking is applied along the ascending, transverse and descending colon. After the patient has learned how to relax under these stroking movements, gentle kneading and rolling and finally rythmical vibration of the various parts of the abdomen are performed. All of this should not take more than ten minutes. There is no reason why the physician himself should not apply abdominal massage with the simple technique recommended. A physician skilled in the practice of massage will greatly improve his sense of palpation and with it his diagnostic faculty. Massage should be given daily, then every other day for several weeks; in many cases results show after the first few treatments; if no improvement is noted within two weeks, massage treatment should be discontinued.

General massage may be conveniently prescribed in such cases of the atonic type where stimulation of the general circulation and muscle tone appear desirable. Ten to fifteen minutes of general massage, following the abdominal massage, is all that is indicated, especially when active exercises also form part of the program. No massage treatment should leave the patient all tired out; the strength and extent of the massage must be adapted to the musculature and reflexes of the patient.

Electrical muscle stimualtion. This form of stimulation of the abdomen combined with massage or applied alone is the most effective measure to tone up the abdominal and pelvic muscles by active contractions; it is

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the method of choice in atonic cases where massage is not practicable or which prove to be more resistant, or where direct stimulation of the pelvic floor is desirable. Electrical stimulation, like massage, also aids peristalsis by reflex stimulation and increases glandular function and the venous return from the abdomen to the heart. There is modern experimental evidence[1] proving that electrical currents exert no direct stimulation of the intestinal walls and the tonic effects enumerated are due to reflex action. The author has obtained equally favorable results by a variety of currents, such as the surging faradic, the interrupted slow sinusoidal and the modulated alternating current. Hence, as long as the type of current employed and the technique of application produce efficient stimulation within pleasant toleration of the patient, it does not matter particularly what make of apparatus and what modification of current is used.

The method employed by the author is as follows: A large moist pad electrode, five inches wide and seven inches long, is placed over the abdomen and another one of equal size directly opposite, under the back of the patient. Either the surging faradic or modulated alternating current (Morse wave) is used; the current strength is gradually increased until definite contractions of the abdominal wall are evident; it should be the endeavor to synchronize these contractions with the rate of respiration, producing about 18 to 20 contractions per minute. Patients seem to tolerate the modulated alternating current better; this can be explained by the fact that the shorter duration of each impulse has a minimal sensory irritating effect. At successive treatments a current of increased strength may be administered, and it can be generally noted that in patients with ptosis the abdomen becomes more firm and bowel movements more regular. Treatments should last from ten to twenty minutes and be administered every other day for several weeks.

In particularly resistant forms of abdominal atony, especially in women after child-birth with relaxed pelvic muscles, a suitable rectal or vaginal electrode is employed instead of a back electrode. In other cases the more powerful static wave current or static induced current may be used.

Exercise. No treatment of chronic constipation is complete without some form of exercise. Two forms of exercise are employed. General exercise serves to improve the general physical state and to react indirectly on the gastro-intestinal function; it may be usefully employed in both types of constipation. Abdominal exercise serves specifically to strengthen the abdominal and respiratory muscles and is chiefly applicable to atonic states.

For general exercise no hard and fast rules can be laid down. Outdoor exercise is preferable, especially when taken regularly and not in one big sweep over the week-end. Tennis, golf, horseback riding, running or swimming, done in moderation and within individual taste and endurance, are beneficial; walking is of comparatively little direct value, as shown by the fact that many persons in occupations which require a great deal of walking, such as letter-carriers, are constipated.

Abdominal gymnastics are valuable when prescribed and carried out systematically within individual tolerance. Exercises that necessitate holding of the breath or keeping the lower trunk muscles in strong continued contraction are not suitable.

There is no end to the variety of different forms of active and passive exercise in the treatment of constipation. Two simple sets of exercises which can be easily demonstrated to every patient are as follows:

(A) Exercise in lying posture; resting flat on the back with hands on the sides.

1. Deep breathing; inhale slowly, hold breath for five seconds; exhale slowly.
2. Raise right thigh with leg extended.
3. Raise left thigh with leg extended.
4. Raise both thighs with legs extended.
5. Raise thighs with knees bent.
6. Raise body upon thighs.

(B) Exercises in standing posture; legs together, with hands on hips.

1. Bend trunk forward as far as possible.
2. Bend trunk backward as far as possible.
3. Carry trunk to right side.
4. Carry trunk to left side.
5. Rotate trunk to right
6. Rotate trunk to left

Exercises are preferably carried out upon rising in the morning; if this is not practical, an hour before lunch or dinner. They can be done on a bed with firm springs and mattress, but still better on the floor, on a folded woolen blanket. They should be performed slowly, each exercise three times the first day and increased by one each day until ten to fifteen is reached. A few minutes rest in supine position is advisable afterwards; patients must be advised to acquire the habit of full body relaxation whenever they rest. Exercises should be done daily for many months; they may be varied according to the individual conditions.

SPASTIC CONSTIPATION

The spastic type of constipation is characterized in its severe forms by contracted, sensitive abdominal walls, tight anal sphincter and typical pencil-shaped stools. It occurs frequently in patients with signs of neurasthenia who present an endless story of their symptoms and who anxiously watch their stools. A mild laxative may cause marked colic in these patients because of the spasm of the intestines and the emptiness of the rectum. In the treament, general nervous relaxation and sedation are indicated, while heat is the chief standby of local treatment.

In the general or constitutional treatment of spastic paralysis general tonic forms of physical therapy are useful, selected according to the individual circumstance. A general light bath in an electric cabinet or under a large heat lamp, followed by a mild alternate hot and cold douche (Scotch douche) may be administered; likewise general irradiations from ultraviolet sources and general forms of exercise, outdoor and indoor, should also be considered.

For the local treatment of spastic conditions heat, the age-old measure for the relief of sensory or motor nerve irritation, is the sovereign remedial agent. In cases of mild local spasm, exposure for half an hour twice a day under a small luminous heat lamp or infra red generator will be beneficial. In more severe forms the penetrating heat effect of high frequency current diathermy is the method of choice. Two large electrodes are placed over the abdomen and back respectively, and from 1500 to 2500 milliamperes of current are employed for one-half hour, four times a week for four weeks. Rendall[3] recently reported favorable results by diathermy in a large number of obstinate cases which had resisted treatment by diet and other measures.

THE ROLL OF WATER TREATMENT

Treatment by water in either form of constipation may utilize the mechanical cleansing effects of moving water or the stimulative or sedative effects of its tem-

perature. It is well known that a glass of cold water on an empty stomach on arising acts as a stimulant of peristalsis in many people; especially when first employed it produces a soft movement within half an hour. The water should never be so cold as to cause a chilly sensation. In some persons, a glass of fairly hot water exerts the same effect. Hence, in atonic types of constipation these mild effects can be utilized.

Water by rectum, in the form of an enema, may be used with advantage at the beginning of treatment in mechanically cleansing the rectum and colon. Tepid water with some bicarbonate of soda and witch hazel serves best for a cleansing enema. A cold water enema at a temperature of 60° to 70° F. acts more irritating than a cold drink and is indicated only occasionally. Cold water may be also employed externally in institutional practice as a cold sitz bath or cold jet douche. alternating with a hot jet—the regulation Scotch douche. In spastic conditions these forms of treatment are strictly contraindicated; however, hot sitz baths at 110° for fifteen minutes and hot enema of the same temperature may be of service.

Colonic irrigations have little if any place in the treatment of constipation. When there is an accompanying colitis or a good deal of intestinal putrefaction, suitable medicated irrigations may be temporarily employed.

General Considerations

Having reviewed the fairly large number of physical agents available in the treatment of constipation, it is evident that the selection and combination of the most appropriate ones depend on the type of constipation and the clinical and radiological findings in the individual case. Regulation of diet and habits are of prime importance, and many cases of constipation can be remedied without the use of physical therapy. As a general rule, however, in most cases it is advisable to institute some form of physical treatment, if for no other reason than to assist in the habit of regularity.

In the carrying out of systematic treatment, it is desirable to discontinue the use of cathartics or at least keep it at a minimum and rather to employ an enema whenever needed. Treatments should be administered in preference daily until regular bowel movements occur. Later, the number of treatments is decreased to three per week, then to two, and finally discontinued after a number of weeks.

The prognosis following the employment of physical measures is excellent in the average atonic case, provided there are no far advanced pathological changes, such as dilatation of the entire colon. Spastic constipation, especially when of long standing, offers as a rule a doubtful prognosis.

Summary

1. Physical measures offer a valuable aid in the constitutional as well as in the local treatment of chronic constipation, especially the atonic type.

2. In atonic constipation general and local stimulation are indicated and the available physical measures are massage, low frequency currents and exercise.

3. In spastic constipation general nervous relaxation and local sedation are indicated; the most effective physical therapy agent is heat in the form of diathermy.

References

1. Reynolds, G. S.: The Response of the Gastro-intestinal Tract to External Stimulation, Radiology, 1931, 8, 1276.

2. Kovacs, Richard: Electrotherapy and Light Therapy, 2nd ed., Phila. Lea & Febiger, 1935, pp. 495.

3. Rendall, V. M. H.: Diathermy in Obstinate Constipation, Lancet, 1932, ii, 284.

Detroit Schools for Crippled Children

Anna L. Mulcahey

Special classes for crippled children in Detroit were started in 1910, and in 1919 the Leland School, the first school in Detroit exclusively for orthopedically handicapped children, was opened. It was not long, however, before this building could no longer accommodate the children seeking entrance and in 1929 the Oakman School was opened. Both of these buildings were planned for the care of the crippled child, and both have, along with many other special features, physical therapy clinics and orthopedic examining rooms fully equipped to provide adequate care for orthopedic cases. The Oakman School is a one-story building built around an attractively landscaped open court, whereas the Leland School is a three-story building equipped with an elevator and ramps for use of wheel chairs, thereby making stair climbing unnecessary.

These special schools are a part of the Detroit public school system and any crippled child who can benefit by attendance is eligible for admission. The question of eligibility in each case, however, is determined after an examination at the school by an orthopedic surgeon who examines each applicant for admission. At this examination not only the physical findings are considered, but also such factors as the need for prevocational training, the advisability of daily rest periods, the problem of arranging for physical therapy treatments, the question of the need for transportation, and the difficulties of stair climbing must be taken into consideration. These conditions and many others together with the physical findings and the results of the mental tests, which have previously been given every applicant, determine the eligibility.

The children are transported to and from the schools by means of coaches provided by the Board of Education and especially designed to meet the needs of the handicapped child. School is held five days a week from nine o'clock in the morning until three o'clock in the afternoon, and includes all grades from the kindergarten through the ninth. Warm lunches, supplied by the Board of Education, are served at noon, and milk and crackers are provided in the mid-morning.

The course of study followed is the same as that used in all other public schools, except that various types of handwork are emphasized to a greater extent. Classes for children with arm disabilities aim to improve the function of disabled arms, and children with uncoordinated spastic hands and fingers attend a therapeutic handwork class. Large rest rooms equipped with cots and blankets are used for daily rest periods, and recreation is enjoyed in both outdoor and indoor play quarters.

An orthopedic surgeon appointed by the Department of Health holds examining clinics weekly at each school. At this time new children are examined for admission to the school and the children already enrolled are re-examined. The State of Michigan reimburses the City of Detroit for the additional expense of educating a handicapped child, and therefore the State Department of Special Education requires that every child enrolled in a special school be re-examined once a year for the purpose of determining whether further attendance is necessary. No recommendations are made by the school surgeon for the children under the care of other physicians. The initial and periodic examination of these cases is for the purpose of ascertaining their eligibility. Children applying for admission, who are not under treatment, are advised about orthopedic care and if necessary are referred for such care to a hospital clinic or to a private physician who is chosen by the parent from a complete list of the orthopedic men in the city. If the patient is indigent and the condition does not require hospital care, but needs physical therapy, the doctor recommends the treatment and the child becomes a patient of the examining physician.

At the present time there are more than eight hundred children enrolled in the two special schools, approximately eighty-five per cent of whom present various types of orthopedic conditions, the remaining fifteen per cent having cardiac disorders. In addition to the care given in the special schools, teachers go into the homes to give instruction to home-bound orthopedic and cardiac cases. Approximately one hundred children have this service at the present time. Teachers are also provided for children who are patients in the convalescent homes of Sigma Gamma and Children's Hospital of Michigan. The combined enrollment in the convalescent home classes usually numbers about one hundred and fifty pupils.

A staff of five physical therapists, two graduate nurses and two attendants carry on the orthopedic work in the two schools under the supervision of an orthopedic surgeon. The surgeon and the nurses are employed by the Department of Health whereas the physical therapists and attendants are employees of the Board of Education. Physical therapy treatments are given daily to children for whom such treatments have been recommended. In every case a written request from the doctor in charge of the case is required before any physical therapy is started, and these requests must be renewed from time to time. Since the majority of the children enrolled are registered at one of the many hospital clinics in the city, most of the recommendations for treatment in the school clinics are received from the orthopedic surgeons connected with the hospitals. Bakers of various kinds, muscle training tables, carbon arc and mercury quartz lamps, a treatment pool and other therapeutic appliances comprise the equipment of these departments.

A classification of the cases enrolled in the Detroit schools for crippled children, exclusive of convalescent homes and home teaching, during the year 1934-1935 is as follows: Poliomyelitis, 26%; spastic paralysis, 21%; cardiac disorders, 14%; bone and joint tuberculosis, 8%; osteomyelitis, 7%; miscellaneous, 24%.

In addition to the usual physical therapy routine for the children who are under treatment, special attention has been given to the spastic group. An exercise class for the purpose of improving coordination of movement, balance and rhythm is held for children with this condition. The class meets daily at nine o'clock, and is attended by a carefully selected group of children who are mentally and physically capable of profiting from such training. Classes for the correction of defective speech are also provided for these children.

It is evident that physical therapy is not indicated for many children attending a school for crippled children. However, every orthopedic case enrolled is under the supervision of the physical therapy department. One of the duties of the physical therapist is to see that each child in school is cooperating with his doctor and following instructions. For this reason each child must report to the physical therapist at least once a month for check up. In this way a very careful record of the physical condition is possible and the parents are constantly being advised to return to the doctor for follow-up care.

This necessitates the education of the parents as well as the child himself, which is an important responsibility of the physical therapy department. The function of a school for crippled children is not only to provide educational training which will equip the handicapped child to take his place in society, but also to influence him to take advantage of every means by which he may secure the maximum correction of his disability.

Helpful Apparatus

Eleanor Farrell

While working with handicapped children at the Spalding School, there developed a growing need for certain equipment suitable as aids to the progress of the children.

Some of our children on entering school are unable to sit up in a wheel chair, so changes have been made in the chair to give additional support. A box twelve inches by twelve inches by four inches is attached to the front of the wheel chair; the bottom level of it is nine and one-half inches down from the seat level. To keep the feet from slipping, blocks of wood, the shape of the bottom of the shoe, are nailed on to the floor of the box. an aluminum strip of metal is nailed to the heel end to prevent the heel slipping back, and two or three straps are nailed to the side to strap in the feet. To give support to the upper part of the body, a tray twenty-two inches by twelve inches fits on to the chair with a two-inch board along the sides and in front to prevent toys from slipping off the tray. It is hollowed out in front to fit the shape of the body and has trick attachments to allow the tray to swing out easily when taking the child out of the chair. (Fig. 1)

One piece of apparatus the child derives benefit

Department of Physical Therapy, Spalding School, Chicago

from and thoroughly enjoys is an adjusted bicycle. (Fig. 2) The seat is taken off and a large one made of wood put in its place. An aluminum sheet ten inches high is nailed on to the seat to support the back, giving the child a sense of security. The pedals are removed. Blocks of wood the shape of the shoe, with a back heel support of aluminum and with three straps, hold the feet on to the pedals. Coming up from the outside of this wooden pedal is an old brace fastened to the pedal at an angle to prevent adduction and increase abduction.

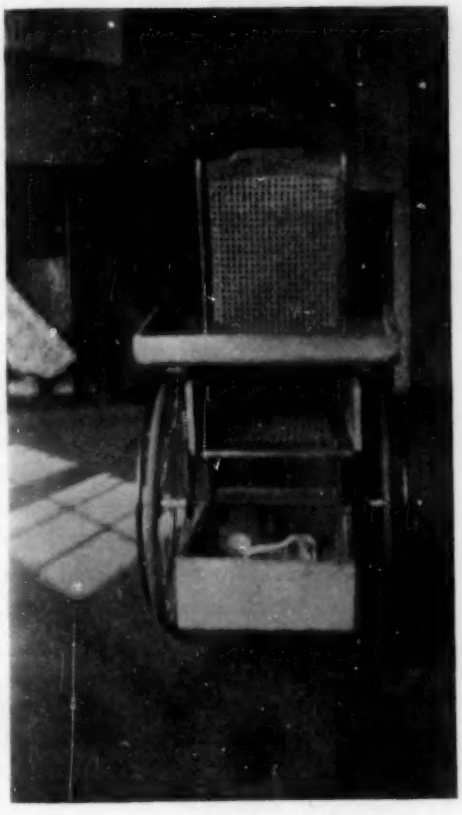

Fig. 1.

Fig. 2.

One of the first walkers developed was one in which complete support is given the child. The frame is made of one inch pipe. The lower frame sixteen inches by thirty inches rests on two swivel wheels in front and two controlled wheels in the rear. Another pipe rod covered with one-fourth-inch rubber goes down the middle to prevent adduction in walking. Four uprights twenty inches high come up from the four wheels and on these uprights rests a frame paralleling the lower one, but open in the rear to allow an easy entrance for the patient. Superimposed on this upper frame is a semi-circle frame covered with one-fourth-inch rubber, which supports the child under the armpits. A strap to strap him in gives further security and support. This type of a walker is used for the most helpless cases, those needing the maximum amount of support.

There is another walker used for a child who can take some of his own support and yet needs a lot of help. A heavy metal plate twenty-two inches by twelve inches is placed on four wheels—two swivel wheels in the front and two controlled wheels in the rear. In the middle of the rear is a twenty-inch upright on which is put an adjustable bicycle handle bar. Sandbags twenty-five and fifty pounds can be loaded on the platform, making the movement slow and difficult. Extensors of arms and legs come into full play. In some cases the child is strapped close to the handle bar to obtain a stronger extensor exercise.

A walker similar to the above but different in that it has the handle bars placed in the front part of the walker and has a rounded frame work, is designed for use in the homes. It is more compact—closer to the patient and covered with rubber to prevent nicking furniture.

When a child is ready to discard a walker for canes he can progress to the use of canes more quickly if he can learn how to use a cane that has a wide base. Six disks ranging from two inches in diameter to seven inches are glued one on the other, and the cane end is pushed down through the center of this pyramid of disks. This makes a steady base and the problem of teaching a child to walk with canes is simplified.

A variation from this cane is a walker cane. The cane is attached to a heavy metal base six inches by nine inches and the base is placed on four wheels. There are children who cannot lift a cane and yet need the support of a cane. This cane on wheels helps such children.

There are children so athetoid that they cannot keep their feet on the floor when sitting in a chair and for that reason it is difficult for them to sit up alone. Shoe supports attached to a board, and straps attached to the shoe support, will hold the feet firm, and give the abdominal and back muscles a chance to develop. In holding the feet firm, there is a feeling of security. I used such a contraption for a child who was so atletoid he had to be tied into his chair to hold him in and even then he would wiggle out of the fastenings. Within three months he was sitting without foot supports and athetoid movements were much diminished.

SIXTH INTERNATIONAL CONGRESS ON PHYSICAL MEDICINE

The Sixth International Congress on Physical Medicine will be held at London May 12-16, 1936. It will consist of sections on kinesitherapy, physical education, hydrotherapy and climatotherapy, electrotherapy, actinotherapy, radiotherapy and radium therapy. American participants will sail from New York on May 2nd on the MV Britannic and return on May 31st on the SS Transylvania. Dr. Richard Kovacs, 1100 Park Ave., New York, is Executive of the American Committee.

The Physiotherapy Review

Editor-in-Chief: IDA MAY HAZENHYER

Assistant Editor: MARGUERITE SVEBILIUS

Business Manager: GERTRUDE BEARD

Associate Editors

MARTHA E. HINDMAN
342 Lowry Bldg., St. Paul, Minn.

SUE ROEN
2417 So. Hope St., Los Angeles, Calif.

BLANCHE B. SINN
112 E. Providence Rd., Aldan, Pa.
Clifton Heights P. O.

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Notice

May we ask all members and subscribers to report change of address very promptly to the business office of THE PHYSIOTHERAPY REVIEW. Such changes should be received by the first of the month. We ask this for your convenience as well as for our own. If we do not have the new address by the time the mailing list goes to the printers, your REVIEW goes to the old and quite likely you do not get it. Second-class matter is not forwarded like first-class mail.

Westward Ho!

All roads lead west in 1936. Come by train, plane, boat or car—but come! Partake of our hospitality and join us in having the biggest and best convention in the history of the Association. Not only the lure of the convention but a trip through Sunny California, with its mountains and redwoods, valleys, deserts, and seashore—with its unusual places of interest, should make you want to pack and join the throng in its journey westward.

Now, what to see, where to go, and what to do.

The territory in and about Los Angeles is replete with interest, scenic and historical. To see all of it would take weeks, but here are a few suggestions of places you must not miss.

The tradition of California comes from its Missions and its old Spanish Grant Ranchos. Three of the Missions—San Gabriel, San Fernando, and San Juan Capistrano—are located near Los Angeles. The Mission San Fernando is situated in the picturesque San Fernando Valley completely surrounded by rugged mountains—a barren desert before the coming of the Padres. Mission San Juan Capistrano is regarded by many as the most beautiful of all the Missions.

From the Plaza, the very spot where Los Angeles began, leads a quaint, colorful little street (which might well have been taken direct from the heart of Old Mexico). This is Olvera Street. Baja California is at home in brilliant dress and sandals, laughing and singing, gaily lazy. Stop at one of the street cafes and have enchiladas and tortillas.

One of the city's many parks is Exposition Park where you can see reconstructed some prehistoric animals from bones taken from the La Brea tar pits in Hancock Park. Here, too, is the Memorial Coliseum where the Olympic Games of 1932 were held.

If you like to see animals, you may visit the Zoological Gardens, the Ostrich Farm with the one and only ostrich race track, the Alligator Farm with alligators from a few weeks to five hundred years old, and Gay's Lion Farm, which supplies the movies, the circus, and the zoos with their wild lions.

Then there is Hollywood! Don't miss the famous boulevard with the haunts of the movie stars, the restaurants, film studios, and theatres. Well known is the Chinese Theatre where the big premieres are held and where you can gaze at the footprints of the stars pressed into the cement of the patio.

The Hollywood Bowl is where the never-to-be-forgotten "Symphonies under the Stars" are enjoyed during the summer evenings. One sits surrounded by shadowy hills and beautiful music with a star studded dome overhead.

On the hills overlooking Hollywood is situated the Griffith Park Planetarium and Observatory, which is one of the very few of its kind. It affords a graphic display of the heavenly bodies equal to a whole course in astronomy. Lectures are given nightly. Attend and watch the flight of the stars and planets as they take their course over the vast dome of the man-made heavens.

Leaving Hollywood and continuing out the boulevard of well known night life cafes, you come to Beverly Hills where reside many of the famous financiers, sportsmen, screen celebrities, and authors. Keep right on up and down hill past the late Will Rogers ranch, the polo fields, beach clubs, and you come to Malibu Beach where the mountains meet the sea.

Last but not least the Henry E. Huntington Library and Art Gallery has reserved an afternoon for our Association members and guests. As only two hundred tickets are issued for an afternoon, they are usually spoken for months ahead, and we are indeed honored to have them hold all two hundred for us until after registration. This Library needs no description. It is the mecca of all the learned men of the world who come to study its rare manuscripts. Remember to ask for your ticket when you register!

Southern California Chapter.

Program for the 1936 Convention

Sunday, June 28th

Registration begins at two o'clock. Come early and meet your friends. National Officers, members of the Board of Directors, and the officers and representatives of the Southern California Chapter will be present to welcome you. Five o'clock in the Patio is the time and place of the "Brag Supper." Be sure to have your Chapter well represented. Each Chapter is to be asked to send in to the secretary a written official report of the Chapter's Activities for the past year. However, at the "Brag Supper" plan to brag openly and brazenly. The written report goes into the records, but the spoken one is for the purpose of getting acquainted quickly with each other and each others problems. We want to know who you are, where you are from and what your group has been doin, right away.

Monday, June 29th.

At ten o'clock Dr. Rodney Atsatt of The Santa Barbara Clinic, will speak on *Fever Therapy*. Dr. Atsatt is also placing an exhibit of unusual interest in the Scientific Exhibit.

At eleven o'clock Dr. Frances Baker, Director of the Department of Physical Therapy at the University of California Hospital in San Francisco, will speak on the topic *The Chronic Patient and Physical Therapy*.

On Monday afternoon there will be an opportunity to visit the scientific and commercial exhibits.

At seven-fifteen in the evening at the Orthopedic Hospital School there will be a demonstration in the *Underwater Gymnasium*. Following this, Dr. Charles LeRoy Lowman, Chief of Staff of the Orthopedic Hospital School will speak. I should say, we hope he will speak as he may be out of town. However, we can tell you definitely in the next issue and announce his topic at that time. Dr. Robert W. Meals will then speak on *The Recent Poliomyelitis Epidemic in Los Angeles*. As many of you may know, this recent epidemic had many unusual features.

Tuesday, June 30th.

The Business Meeting is at ten o'clock in the morning. Election of officers and presentation of other business will be made.

At two o'clock there will be a symposium on *Body Mechanics*. Dr. Sven Lokrantz, Director of the Health Service Section of the Los Angeles Public School will preside at this session. Miss Claire Colestock, Assistant Director of Physical Education in the Pasadena City Schools, will speak on *The Methods and Results of the Foot Survey Carried on in the Pasadena Schools this Year*. Miss Edith Lindsay, of the Physical Education Department at Mills College, will be the next speaker. Her topic will be announced in the next issue. Miss Margaret Jewell, of the Women's Physical Education Department of San Jose State College, will then speak on *Posture Correction Through the Dance*. She and six major students in physical education will also present several progressions in technics involving various parts of the body, followed by two or three dance compositions.

Tuesday evening is the Banquet, which will be formal again this year. We are particularly fortunate in having Dr. Frederic P. Woellner of the University of California at Los Angeles as our speaker. He will speak on the topic *Mental Maturation*. So, look forward to a big evening.

Wednesday, July 1st.

At ten o'clock Dr. Steele F. Stewart will speak on the *Evolution of Muscular Physiology*. Dr. Stewart is exceptionally well qualified to speak on this topic.

At eleven o'clock Dr. William M. Happ will speak on some phase of physical therapy in pediatrics. His exact subject will be announced later.

At two o'clock there is to be a Symposium on

Convention Headquarters.

Mental Hygiene. Members of our own Association will present cases that have come under their care which exhibit more mental than physical symptoms. These speakers will be Ruth Aust, Hazel Furscott, Dorothy Graves. Dr. James Houloose from the Long Beach Public School will then discuss *Normal and Abnormal Mental Mechanisms.* He has a fascinating approach to the subject. The Symposium will in no way duplicate last years Panel Discussion in which strictly pathological conditions were discussed.

In the evening a trip through at least one movie studio has been planned. We hope to give you exact information about this trip in the next REVIEW.

Thursday, July 2nd.

There will be a business meeting beginning at nine o'clock in the morning.

In the afternoon a trip to the Huntington Library in Pasadena has been planned, as you will read in the news from the Southern California Chapter.

The Southern California and The Northern California Chapters will be very happy to help you plan to see Clinics, Hospitals, etc. Do plan to go back by way of San Francisco.

Let me remind you again of the possibilities of combining convention, study and vacation. There have been six inquiries already about the Anatomy Course at Stanford University. The number will be limited, so if you are interested please write to me immediately. The course begins June 18th and closes August 15th. We plan to take the week of convention out, which will double up on the work a little before and after. There is also the Graduate Course at the Orthopedic Hospital in Los Angeles. University credit may be secured for this course through the University of Southern California.

Catherine Worthingham,
Convention Chairman, San Jose State College,
San Jose, California.

Exhibits

If you have not already filled out the blank notifying Mrs. Broemser of your intention of entering the Scientific Exhibit, please do so as soon as possible, as she wishes to assign space and arrange the entire exhibit to the best advantage. Remember that an exhibit may be any size. It may involve one picture or twenty. Descriptive matter, appliances, models, surveys, case studies, anything that you care to enter. Even if some of your material has been shown before it will be of interest here as there has not been a Physiotherapy Association National meeting here on the West Coast for several years. Remember that you may enter individually, by chapter, or by institution.

The commercial exhibits will be most interesting. Only equipment approved by the Council on Physical Therapy of the American Medical Association will be shown. It will be an excellent opportunity to see the latest in approved equipment.

It may interest you to know that the American Physiotherapy Association exhibit *Modern Technics in the Exercise Treatment of Faulty Body Mechanics,* which was shown in the Educational Division of the Scientific Exhibit of the American Medical Association in June, 1935, and at the Convention of the American Congress of Physical Therapy in Kansas City in September, 1935, is now in the building devoted to Medical Science in the San Diego Fair.

The American Physiotherapy Association is to have a booth in the Educational Division of the American Medical Association Exhibit again this year. The exhibit will be entitled *An Analysis of the Exercise Treatment of the Foot.* It will present: (1) Significant points in the kinesiology of the foot; (2) An analysis of foot exercises; (3) Contraindications for the use of certain foot exercises; (4) A demonstration of foot exercises.

Cocoanut Grove.

Come to the Convention!

What a thrill to know that the world-famous Los Angeles Ambassador Hotel, whose slogan is "A Twenty-two-Acre Playground in the Heart of a Great City," will be convention headquarters for the American Physiotherapy Association from June 28th to July 2nd, this year!

The Ambassador is the almost fabulous hotel which is the center of the smartest activities and the most exclusive shopping district of Los Angeles and its gay and vivacious little sister, Hollywood. The Scintillating Cocoanut Grove is where the stars of the motion picture and theatrical world mingle with society nightly to the music of the greatest dance orchestras. Delegates should come to this year's convention prepared not only for the business sessions but for the round of entertainment and social functions that will center at the Ambassador.

Lunch at the Cafe de la Chasse—unique open air Parisian Restaurant, the place for cocktails and light refreshments. One enjoys the relaxation of a delicious luncheon beneath the deep blue sky.

A stroll through the inviting gardens. This quiet loveliness may be interrupted by a jungle roar—ah! the Zoo. The lions, the bears, heterogeneous birds of beautiful plumage, and even the kangaroo; all live in enclosures constructed to conform, as nearly as possible, to their native environments. The Ambassador Lido is the swimmers' delight; crystal clear plunge, vast Monterey sand bathing beach. Then there is the delightful game of window shopping and the thrill of buying in the smartest of smart shops.

In the evenings to dine and dance in the world famous Cocoanut Grove! A ringside table in the Grove —the cocoanut palms, starlit sky, and blinking monkeys. See the prominent movie stars and other celebrities.

We have made arrangements with the Ambassador Hotel for special convention rates as follows:

$3.50 per day, per person, two in twin-bedded room with bath.

$5.00 per day, room and bath, single.

For those who wish rooms without bath, are the following rates:

$2.50 per day, per person, two in room without bath.

$3.50 per day, single.

We can also provide suites with connecting bath at $12.00 per day for four persons, and $10.50 per day, three persons in room.

A letter and reservation card will be mailed to each member direct from the Ambassador Hotel. We suggest and urge that prompt reply be made to assure the best accommodations. It is also suggested that groups of three and four make up parties to occupy the suites as set forth above, thus reducing room expense.

REMEMBER THE DATES—JUNE 28th TO JULY 2nd.

Emma Hansen, President,
Southern California Chapter.

Report of the Nominating Committee

The nominating committee has followed the custom of rotation in preparing the tickets for the coming election of officers, to be held in June. The members were selected from our Eastern membership, one ticket representing the Northern part and the other the Southern part. The directors were chosen, as usual, from other parts of the country.

The election is to be held on the first day of the convention. Other nominations may be presented from the floor at that time.

The tickets are as follows:

Ticket—Northern

President—Constance Greene, 53 Burpee Road, Swampscott, Mass.

1st Vice-President—Dorothy Frederickson, 11 Chelsey Road, Newton Centre, Mass.

2nd Vice-President—Winifred Tougas Williard, 51 Lawrence St., Malden, Mass.

Treasurer—Cecelia Leverone, 668 Washington St., Brighton, Mass.

Directors—Mrs. Sarah Colby, 932 N. Curson Ave., Los Angeles, Calif.; Gertrude Beard, 303 East Chicago Ave., Chicago, Ill.; Marguerite Irvine, 1011 Summit Ave., Seattle, Wash.

Ticket—Southern

President—Mrs. Caroline Brown, New Haven Hospital, New Haven, Conn.

1st Vice-President—Lila Finley, 23 Haven Ave., New York City, N. Y.

2nd Vice-President—Marion Bryant, 1431 Spruce St., Philadelphia, Penna.

Treasurer—Mary Lou Kelland, 18 N. 20th St., East Orange, N. J.

Directors—Mrs. Sarah Colby; Lillian Beckman, 7425 Harvard Ave., Chicago, Ill.; Helen Kaiser, Mt. Sinai Hospital, Cleveland, Ohio.

Respectfully submitted,
MARIE FACKT, (Chairman),
EDITH MONRO,
JESSIE STEVENSON.

Members of the Chicago Chapter are enjoying a short course at Northwestern Medical School, *Skeletal Muscle and Motor Activity in Health and Disease,* offered by Dr. Herman Chor. The course extends from February third to April sixth, and it carries one hour of credit for those who wish the credit. It is a lecture course beginning with the embryology, histology and pathology of muscles and leading into the motor activity in health and disease.

ABSTRACTS

John S. Coulter, M. D.

The Use of Heat in Diseases of the Nervous System

Clarence A. Patten, M. D., Philadelphia, in Jour. A. M. A., 105:10:797, Sept. 7, 1935.

Heat in the Psychoses.—Heat is generally used systemically in the treatment of the psychoses and is usually of considerable advantage if used over a long period of time. It is definitely of greater value in the agitated and maniacal mental states because of its sedative effect, but it is not particularly effective in the depressions except occasionally in agitated melancholia. In the acute depressions of the maniac depressive psychoses it may be of slight value, but experience has shown that it does not influence the course of the disease. The means by which heat is applied in mental states in the order of their efficiency are: 1. The continuous hot bath. 2. The cold pack. 3. The warm pack. 4. Cabinet sweats. 5. Conditioned heat.

The continuous hot bath is used particularly in cases of maniacal excitement and maintains a steady temperature of about 96 to 98 F and sometimes more.

Neither cold nor warm packs are used in the presence of circulatory or cardiac derangement or when the patient is in a very weakened condition. During the time the patient is in a pack a nurse must be in constant attendance, observing the color and pulse rate of the patient. In case of an abnormal reaction the patient must be immediately removed from the pack. When the treatment is to be terminated, one blanket is removed at intervals so that the patient cools down gradually. A pack is usually followed by a shower and then an alcohol rub or a light massage.

Electrical cabinet baths are frequently used for cooperative mental patients for the purpose of obtaining the effects of varying degrees of heat over a short period of time as well as elimination through free perspiration. Usually the cabinet is followed by a needle spray of warm and then cold water for its tonic effects, and after that massage may be employed.

In the psychoneuroses the so-called tonic electric cabinets given every day and followed by hot and cold contrast showers afford a great stimulus to the patient and in addition occupy a certain part of his time, which is of importance. Hydrotherapy in the form of hot and cold showers alone can be given daily. The method of application of these procedures has been commented on under arthritic and rheumatoid conditions, but it must be again emphasized that electric "baking" with hydrotherapy is only a part of the general treatment of the neuroses and dependence must not be placed on it alone.

Heat is of the greatest value in inflammations of the peripheral nerves and in vascular diseases in which implication of the nervous system is evidenced by pain of greater or lesser severity. In the various neuritides, in neuralgia, in radiculitis or in inflammation of any of the nerves in the limbs, heat, and particularly dry heat, allays the inflammation and pain. In neuritis, in certain areas, care must be taken to give a sufficient amount of treatment, for the penetration must be deeper in some parts than in others. Heat is only one mode of treatment, as frequently a neuritic condition is part of an arthritis. Electrical treatment, principally in the form of diathermy, may be more efficacious. In cases of toxic infectious multiple neuritis, heat is applied to the extremities by attaching electric light bulbs to the central pole of a cradle placed over the patient. In these cases any degree of heat may be used that is desired and most patients find it very comfortable. The cradle serves the additional purpose of keeping the bed clothes off the patient's sensitive limbs. This form of heat therapy may also be used for a neuritis or vascular disorder localized to one limb and, by continuous application, may afford a progressive relief from the painful symptoms.

In certain vascular diseases of the limbs, such as erythromelalgia, Raynaud's disease, thrombo-angiitis obliterans, thrombophlebitis and endarteritis obliterans, dry heat applied to the diseased parts more or less constantly over a period of days causes an alleviation of the symptoms of pain. It is not a cure but is used mainly for the relief of pain and for improvement of the circulation. The modern operation of sympathectomy offers much more hope of permanent relief in certain types of cases.

Even in chronic diseases of the nervous system, such as hemiplegia or lateral sclerosis, when the limbs are spastic, heat will decrease the spasms and contractures, at least for a time and will moderate other symptoms.

Nonoperative Treatment of Inadequate Peripheral Distribution of Blood

Passive Vascular Exercises and Local Hyperthermia
Louis G. Hermann, M. D., Cincinnati, in Jour. A. M. A., 105:16:1236, Oct. 19, 1935.

The treatment of deficiencies of peripheral circulation is extremely difficult and may tax to the utmost the ingenuity of the physician or surgeon. In general, it may be said that all therapy for these disturbances should be directed toward

1. Prevention of infection of the poorly nourished tissues.
2. Reestablishment of an adequate collateral arterial circulation.
3. The relief of pain.

The local hygiene of the feet and the prevention of mechanical, chemical and thermal trauma to the parts will aid materially in preventing infection from gaining entrance into the tissues of the affected extremity.

It was the search for a more physiologic means of preventing the serious sequelae of obliterative arterial diseases of the extremities that led me to attempt to stimulate the development of an adequate circulation through the collateral arterial pathways by rhythmically decreasing and increasing the air pressure about the affected extremity. The physiologic effect of diminished or increased environmental pressure had been known for centuries and was applied clinically as a means of increasing the circulation in an extremity as long ago as 1803 by Ralph Blegborough of England.

Passive vascular exercises have been shown to be an effective means of overcoming the vascular insuffi-

ciency in the distal portions of an extremity after acute occlusion of the major arterial pathways has resulted from arterial embolism, arterial thrombosis, ligation of major arteries, or surgical incision of aneurysmal (syphilitic) sac with ligation of the incoming and the outgoing artery. Frozen feet of all degrees have responded promptly and the serious sequelae of extensive thermal trauma have been prevented in all cases treated by this method in our clinics.

Arteriosclerosis obliterans with or without gangrene and with or without the association of diabetes mellitus has proved to be amenable to passive vascular exercises, since the ischemia of the extremity can be quickly overcome and the gangrene made to demarcate. The presence of moist gangrene adds materially to the seriousness of the disturbance and hinders the development of an adequate collateral arterial circulation due to the widespread destruction, by inflammation, of the smaller arterial and arteriolar pathways in the extremity. It is especially in this type of patient that the combination of local hyperthermia and passive vascular exercise finds its greatest use.

In the treatment of gangrene, clinical judgment must be exercised in all cases, and a conservative method of treatment is never to be recommended when only heroic surgical procedures are indicated. Passive vascular exercise has been suggested primarily as a means of preventing the serious complications of organic arterial diseases and not as a cure for extensive gangrene. In selective cases, especially in the fourth and fifth decades of life, the method offers a real aid to those who prefer to do the more conservative types of amputations through the foot or lower leg.

The Therapy of the Cook County Hospital

Edited by Bernard Fantus, M. D., Chicago, in Jour. A. M. A., 105:2:115, July 13, 1935.

Therapy of Psoriasis

Outline by Dr. Theodore Cornbleet:

General Measures. The patient is given a thorough physical examination, and anything abnormal is corrected. The treatment for the skin condition itself proceeds as follows:

1. Diet.—A low protein diet has been advocated by many, who believe that it is helpful to reduce or entirely eliminate animal foods, including in this meat, eggs, poultry and fish, and in addition to forbid the use of peas and beans and fermented cheese.

2. Climate.—Psoriasis is generally worse or it recurs during the winter season and usually improves with the appearance of warm weather. Many patients improve when they go to a warm equable climate, and they may thus at times prevent the recurrence that they otherwise get with the advent of cold weather.

3. Drugs.—(a) Arsenic is, of all the internal remedies advocated, the most important.

(b) Salicylate is held in high favor, particularly in early acute cases with considerable itching, in which arsenic is contraindicated as it makes the itching worse. Sodium salicylate is generally used.

Local therapy. General measures alone usually do not suffice to clear up an eruption. They require the aid of local applications.

1. Removal of scales.—The removal of scales that have accumulated on the lesions and offer an inert barrier to the effective action of the medicaments must precede all local treatment. It may be accomplished by daily warm baths with Liniment of Soft Soap ("tincture of green soap") and water.

2. Soothing applications.—Care must be used in the acute types or in the generalized forms not to use too stimulating an agent lest the skin be irritated and the eruption converted into an exfoliative dermatitis. In psoriasis, salves act better than lotions. In the acute forms a soothing ointment, such as Ointment of Rose Water (cold cream) or Boric Acid Ointment is likely to be found useful.

3. Irritative applications.—These for the most part are reducing agents. The preferred ones are powerful.

(a) Chrysarobin is one of the most effective. Chrysarobin itself should not be used on the hands, face or scalp because it colors the normal skin deep brown and the hair yellow and it produces conjunctivitis.

(b) Tars of various types, such as wood tar, oil of cade or coal tar are preferred by some physicians, who no longer use chrysarobin because of its obvious disadvantages and because it may vary in its effectiveness from sample to sample.

(c) Ammoniated Mercury is mostly used for the scalp.

4. Irradiation.—(a) Ultraviolet rays are most useful in the acute types of psoriasis as well as in the superficial types in folds. Some believe that their use at intervals, after involution of an eruption by other measures such as x-rays, may materially prevent recurrences. The exposures should be given twice weekly and to the point of obtaining definite reactions with pigmentations. The method is not quite so effective as that with the x-rays but is free from possibility of dangerous sequelae. A method that has been particularly effective is the combined use of one to five per cent coal tar ointment with ultraviolet rays. The ointment is spread on the skin about one-eighth inch thick. At daily intervals the excess ointment is wiped off with olive oil, a thin film of the crude coal tar being left. Irradiation with a mercury quartz lamp is then carried out. This is said to be particularly effective in the exfoliative dermatitis following psoriasis. This form of treatment should be carried out only in a hospital or where the patient can be closely supervised; but in modified form it can be used for ambulatory patients.

(b) When judiciously used, roentgen therapy is effective, painless and clean and requires no care on the part of the patient.

The Influence and Therapeutic Use of Heat

Ralph Pemberton, M. D., Philadelphia, in J. A. M. A., 105:4:275, July 27, 1935.

Nephritis

There is probably no other condition in medicine in which the systemic use of external heat has been longer thought to have consequences of value than that of nephritis. Whatever other pathologic manifestations may accompany nephritis, certain symptoms demanding treatment are apparently dependent on the retention of toxic material, possibly of a nitrogenous nature, salt or water, and acid products of metabolism, especially phosphates and sulphates.

The argument has been advanced that, in the presence of toxemia from renal insufficiency and retained nitrogen, sweating serves only to concentrate the blood and to add to the danger from the retained substances (Textbook of Medicine, 1927). There is some doubt as to the validity of this, however, as the blood maintains its water balance with great tenacity, drawing on the tissues for this purpose, and the evidence is not final that under conditions of ordinary therapeutic procedure the blood undergoes any true concentration (Pemberton,

1927). Furthermore, in the absence of inability to excrete water there would seem to be no objection to the administration of fluid to prevent concentration, as is indeed the practice in many hospitals. It is to be borne in mind, however, that the elimination of water constitutes one of the functions of the kidney, and as O'Hare (1934) points out, a further burden may be added and even pulmonary edema may arise from undue administration of fluids.

Finally, it should be stated that the results believed to be achieved may be due to changes induced by heat in the blood flow, to an alteration of metabolism, or, in nephritis accompanied by acidosis, to the production of a systemic alkalosis. Whatever the mechanism and whatever the difference of opinion as to the theoretical benefits to be obtained, however, it is probable that some experienced clinicians would be unwilling to withhold application of the sweat process as a practical method of treatment in the toxic nephritis under discussion.

Another phase of renal dysfunction in which the sweat process has long been regarded as of value is that accompanied chiefly by retention of salt and water. While the bowels may be made the channel for elimination of water in large quantities by hydragogue cathartics, water can be eliminated in equal or even greater amounts through the sweat. Evidence has been presented that salt may be removed through the sweat channels in amounts equal to or larger than those occurring in the feces.

The practice of giving sweat baths in nephritis is less common than formerly. The modern view of therapy in chronic Bright's disease, is directed toward the eliminations of toxins which, in passing through the kidney, may aggravate the renal lesion. This means the eradication of infection, proper elimination from the bowel, and finally a diet so devised as to avoid undue strain on the renal system by all products of excretion. This, of course, may include the ingestion of water. It would appear that proper adjuvant use of the sweat channels would be complementary to the foregoing procedures, but the problem is fraught with many difficulties that have not been wholly threshed out.

The particular manner in which heat is systematically applied in nephritis is of secondary importance; but the simplest form, and one that can be carried out in any household, is the hot pack already briefly mentioned.

Arthritis and Rheumatoid Conditions

The field in which the application of external heat, both systemically and locally, has its most extensive and varied application is probably that of arthritis and rheumatoid conditions. The full benefits to be derived from the systemic use of heat in this connection are not always forthcoming from the heat alone, however, and sometimes depend on contrasting and accessory applications of cold. The latter phase of treatment constitutes an essential part of hydrotherapy, and the details of the conduction of this measure in its various forms will be considered in the section devoted to that topic. The matter will be discussed here sufficiently merely to indicate the general application of heat to the rheumatoid syndrome.

The sweating process alone, without the cooling contrast shower, is easier of attainment and can be brought about by means of the hot pack or hot bath in almost any household. In many instances, the metabolic stimulus given by this single procedure is of great value and should be utilized when circumstances justify it. Some of the effects of cooling hydrotherapy can be achieved by means of the bed sponge or bath, but care must be used to avoid chilling. If the sweating process is prolonged and perspiration is profuse, the patient must rest for an hour or more before rising, or depletion and fatigue will result.

Some further mention must be made of the influence of induced fever, probably most conveniently achieved in the rheumatoid syndrome through diathermy. The whole subject of the influence of induced fever on various disease states is still far from being thoroughly understood, and this limitation applies equally in respect to the treatment of arthritis by means of it. There is some evidence to indicate, however, that in certain phases of the arthritic syndrome, especially perhaps the more acute states, beneficial results may follow the induction of sustained fever up to 104 or even 106 F. Differing uses of nomenclature as well as uncertainty as to diagnosis make it difficult to attach finality to the value of the beneficial results reported to date. Gonorrheal arthritis has also been reported, on more substantial evidence, to be benefited. In view of the varied etiology of arthritis, however, conservatism should be exercised in applying this potent measure indiscriminately to large groups of cases, in that many of them are asthenic and poor candidates for radicalism of any sort.

Local Application of Heat in Arthritis

The application of external heat locally to a joint or joints in arthritis is often of the highest value. The principle obtains here, as elsewhere, that reliance must not be placed on this measure alone. It must be considered in conjunction with other principles of treatment of the disease as a whole, and the joint in particular. The measure most often used in conjunction with local external heat in arthritis is massage and although often misused in ignorant hands, it constitutes an almost necessary adjunct to the use of heat alone, especially in the form of effleurage. The forms of heat available for local use are discussed at the beginning of this article. The value of the heat can sometimes be enhanced by incorporating with it some other principle, as in the use of a hot saturated solution of magnesium sulphate applied to the affected part and kept hot by repeated application or a radiant lamp. This procedure sometimes greatly relieves pain. Application of heat should not be carried to the point of irritation and should depend for its effects on repeated use, once or twice a day, over a period varying from about ten minutes to half an hour. The temperature within the apparatus should not be above 82 C .(180 F.), or the duration of treatment greater than twenty minutes at the outset. Temperature and length of exposure can be slowly increased.

Functional Neuroses as Complications of Organic Disease

An "Office" Technic of Approach, with Special Reference to the Neurodermatoses

John H. Stokes, M. D., Philadelphia, in Jour. A. M. A., 105:13:1007, Sept. 28, 1935.

For the past fifteen years a special interest in the functional neuroses and in behavior problems has led me to develop, from a variety of sources, a technic of "office" analysis and treatment of this now recognized element among the many causes of cutaneous disease A sufficient number of patients have considered this feature of the management of their cases at my hands as an important element in their permanent recovery or satisfactory ad-

justment to encourage me to present the mode of approach for trial in cases in which circumstances do not permit or justify the calling of a neuropsychiatric consultation and special or sanitorium treatment. With apologies, under the pressure of condensation, a highly didactic form is used, without citation of case illustrations or discussions of percentage results.

A Technic for Rest:The Six-Point Attack

It is understood that this paper is concerned with those who must keep going; it describes an office, not a sanatorium approach, though perhaps applicable in "rest house" conditions, too. As I present it to the patient, the method revolves about six principles, as follows:

1. A temporary repudiation of responsibility and a defense against overload obtained by one or all of four methods:

(a) The adopting of a DGAD (don't-give-a-damn) attitude. To those who find this way of phrasing it unpalatable, other angles or alternatives may be offered, ranging from "Let the other fellow do the worrying," and the conscious shifting of the burden of the seemingly unadjustable onto the shoulders of the Infinite, as in the Divine Mind of certain religious groups. The release of some forms of prayer may be a proper variant on this mode of tension reduction, the upper end of the spectrum of fiat lux, so to speak.

(b) The sloganization of the casual and the ephemeral as opposed to the enduring and purposeful, a temporary fatalism expressed in the phrase "A hundred years, ten years from now, what will this matter?"

(c) An attack on the procession of "musts" by an outright resigning from blocks of obligations and the temporary repudiation of others. Only the completely egocentric person suffers from the delusion that his world cannot go on without him.

(d) An attack on "destinationism," the worship of the goal and disregard of the method, the excess purposefulness, usually competitive and designed to beat the other fellow, which marks the pillar and victim of our American type of civilization. This is the distinctive inability to play for the sake of the game instead of the victory that mars our sport and makes our virulently score-counting golfer quite as much as our business man an object of pity rather than respect.

2. Discipline in objective self analysis by the deliberate division of the personality into overmind and undermind. This is sloganized as the "Big and Little Mary" device, in which the wiser oversoul talks soothingly and illuminatingly to Little Mary, the perverse and mischievous sprite whose rebellions, leapings and gyrations keep the personality in a state of turmoil.

3. A reeducation in impersonal detachment by an attack on das liebe Ich, the "Beloved I" of the competitive, egocentric, striving, achieving personality, which cannot bear defeat or brook second place. The sense of the personal unjustness of life and fate is an often unrecognized phase of this personality trend.

4. A technic of neuromuscular tension detection and release. Even so-called rest in bed may fail to provide it unless special instruction is given.

5. A technic of neuromuscular tension discharge. This is the objective of occupational therapy broadly conceived.

6. Invocation of the sense of the ridiculous. Like love and hate, anger and laughter are the obverse and reverse of the same discharge pattern, so to speak. The conception is valuable in detoxifying chronic or recurring as well as acute exasperations. It acts, as has been said, through the sense of the ludicrous, which even a hard pressed personality is slow to lose. "Smile, damn you, smile."

The aggregate effect of bringing several of these conceptions to bear on the patient's problem is to put a disturbed personality at rest; and I believe that, valuable though physical or bed rest when ordered may be, its usefulness is often defeated by insufficient attention to the detail of mental and nervous rest. My earlier experience with hospitalization and the later need for producing the same results under ambulatory and office conditions in patients who positively could not without financial and personal disaster seek their beds or submit to a full neuropsychiatric procedure have convinced me not only of the very fair proportion of effectiveness but also of the positive advantages of this approach in the dermatoneuroses. The patient recovers by a positive process of adjustment to his environment, rather than by isolation and segregation from it. It is, of course, granted that there are patients who cannot recover in their usual environment, but they are fewer than is generally conceived. The patient managed by this technic is, moreover, armed in a positive way by reeducation for the future, rather than merely tided over the present situation by his rest.

On the Mechanism of Photosensitization in Man

H. F. Blum, W. G. Watrous and R. J. West (From the Division of Physiology, Univeristy of California Medical School, Berkeley, California); in Am. J. Physiol., 113:2:350, Oct. 1, 1935.

Discussion. It would seem well to summarize the differences in the three types of photo-response described above:

A. Normal erythema is produced by ultraviolet radiation of wave lengths less than 3200 A. This is a delayed reaction, erythema appearing an hour or more after moderate exposure; it is followed later by pigmentation. Both erythema and pigmentation are independent of O_2.

B. Urticaria solare manifests itself as a "triple response." It is produced by visible light (4000-5000 A). The response is immediate, whealing occurring in a very few minutes. It is not followed by pigmentation, and is independent of O_2.

C. The photodynamic "triple response" follows artificial photosensitization, and is similar in appearance to B. It is produced by those wavelengths absorbed by the particular sensitizer. The response is immediate, whealing occurring in a few minutes. It is followed by pigmentation and does not occur in the absence of O_2.

Changes in the Blood and Circulation with Changes in Posture. The Effect of Exercise and Vasodilatation

John B. Youmans, J. H. Akeroyd, Jr., and Helen Frank; (From the Department of Medicine, Vanderbilt University Medical School, Nashville); in J. Clin. Invest., XIV:6:739, November, 1935.

In the erect posture the forces tending to filter fluid from the blood into the tissues of the dependent parts are much greater than in the recumbent position.

The Effect of Muscular Activity on the Changes in the Blood Resulting From the Erect Posture

The influence of muscular activity was determined by comparing the changes in the composition of the blood and in the leg volume of an actively moving leg in the

erect posture with those of the opposite leg which was kept motionless. In addition a few observations were made of the capillaries in the great toe of the quiet leg.

The subjects consisted of six young healthy men (students) and one man with nutritional edema.

Summary

In the erect posture active muscular movements of the leg are accompanied by less concentration and less rise in colloid osmotic pressure of the blood in the moving leg than in the other leg kept motionless. At the same time there is a smaller increase in the volume of the moving leg, and, in some cases, an actual decrease compared with its volume in the reclining position. In the quiet leg in the erect posture the capillaries of the toe are dilated and the number of open capillaries increased.

Changes in the Circulation in the Feet and Legs, Quiet and Active, as Shown by Changes in the Surface Temperature

Changes in the circulation in the feet and legs under different conditions of posture, exercise and temperature were studied by observing the changes in the surface temperature.

The subjects were young, healthy men and women. The following general procedure was followed with certain variations which will be described below. The subjects reclined with the feet and legs exposed to above the knees for an hour or so. During this period the surface temperature of the feet and legs at the base of the great toe, over the external malleolus and over the mid leg on the anterior surface, was recorded with a thermocouple. Room temperature which was maintained as constant as possible, with a variation of about one degree centigrade, was measured with a mercury thermometer suspended near the feet and legs. After the surface temperature of the feet and legs had become relatively constant the subject stood as quietly erect as possible for periods of 60 to 75 minutes, and the surface temperatures were recorded at frequent intervals. Contact of the feet with the floor was prevented by a blanket. After the standing period the subjects again reclined, and the changes in surface temperature were followed. In most of the experiments the environmental temperatures were rather high, 28 to 30 C. Some of the experiments were performed in a constant temperature room at temperatures of 19 to 24 C.

In order to compare the effect of exercise and quiet standing on the surface temperature of the feet and legs, the following experiment was performed. After the initial period of reclining the subject mounted a stationary bicycle so arranged that he was able to stand nearly erect and quietly on the left leg while pedalling against an adjustable resistance with the right. Pedalling was continued for approximately one hour, except for brief periods to determine the surface temperatures which were measured at intervals of about five minutes in each leg. At the end of the period on the bicycle the subject again reclined, and the changes in the surface temperature were followed further.

Summary

Assumption of the erect posture is usually accompanied by a prompt and significant fall in the surface temperature of the feet and legs. This drop occurs in a warm as well as in a cool environment, and in the muscularly active (pedalling) leg as well as in the quiet leg in spite of a presumably greater and more rapid total blood flow in the former.

Circulation Time in the Quiet and Moving Leg in the Erect Posture

Summary

In the erect posture the circulation time in the quiet leg is much longer than in the reclining position. On the contrary, the circulation time in the moving leg is often shorter than in the reclining position, and hence often several times shorter than in the opposite quiet leg.

The Influence of Vasodilatation on the Changes in Composition of the Blood Which Occur on Standing

Summary

Heating of the forearms and hands was accompanied by a rise in the surface temperature of the feet (toe) with the subject erect, overcoming the drop in surface temperature which occurs in the quiet standing posture.

Vasodilatation resulted either in a greater or a lesser concentration of the blood in the feet and legs in the erect posture than occurs without vasodilatation. In either case, the total volume of fluid filtered into the tissues of the leg appeared to be greater with vasodilatation.

Summary and Conclusions

In summary, the exchange of fluid between the blood and tissues, primarily controlled by capillary and colloid osmotic pressure, is greatly influenced by a number of secondary factors, particularly by posture. The great tendency to edema in the quiet erect posture is opposed by a rising colloid osmotic pressure and by an increasing tissue pressure in the feet and legs. These forces are aided by a decrease in the volume and velocity of the circulation in the legs. With muscular activity an even greater volume of filtrate than occurs on quiet standing is prevented from accumulating by a more active lymphatic drainage. Variations in these secondary factors will influence the exchange of fluid between the blood and the tissues and, in the presence of even slight changes in the serum proteins and capillary pressure, may determine the appearance or non-appearance of edema. Due consideration must be given to the influence of these secondary factors in interpreting the effect of abnormal variations in the fundamental forces concerned, especially under conditions of changing activity such as exist in ambulatory patients. For these reasons it is inadvisable to define too strictly the critical level of the serum proteins or venous pressure in relation to the pathogenesis of certain forms of edema.

Fever Therapy Departments Seen as Coming Need in Hospitals

Frank H. Krusen, M. D., Director, Temple University Hospital, Philadelphia; in Mod. Hosp., 45:1:86, July, 1935.

The marked interest recently manifested by physicians throughout the United States in the production of fever by physical means should attract the attention of hospital executives, for the time is coming when each up-to-date hospital will need a fever therapy department.

When to Use Fever Therapy

Among the diseases they (representatives at the fifth annual Fever Conference) reported as possibly being amenable to fever therapy produced artificially by physical means, were gonorrheal urethritis, arthritis, and pelvic inflammatory disease; neurosylphilis; ocular syphilis; atrophic arthritis; chorea; pulmonary tuberculosis; multiple sclerosis; neuritis; bronchial asthma;

Parkinson's syndrome; osteomyelitis, and peripheral vascular disease.

While opinions varied considerably as to the usefulness of artificial fever in all of these conditions, the results were so encouraging in many of them that it is certain this form of therapy will gain wider recognition and use in the next few years. In gonorrhea alone, the results from all quarters were uniformly so good that one group of workers stated "it bid fair to supplant all other forms of therapy."

Artificial fever therapy (hyperpyrexia) should be strictly a hospital procedure. The council on physical therapy of the American Medical Association says: "The council believes that this method should be used only in hospitals, surrounded with the safeguards commonly employed in a major operation and under the direction of skilled physicians." The group at Dayton repeatedly stressed the necessity for having skilled nurse technicians to give these fever therapy treatments.

Various devices are used to produce the fever. Radiant heat cabinets, short wave diathermy machines and air conditioned cabinets head the list, but it has been noted repeatedly that it matters little what type of device is used, if it is adequate to do the work and if the technique of the physicians and nursing personnel is well organized.

Cost Is Warranted

These fever therapy departments are expensive to organize and conduct; nevertheless, the income from the treatments can be adequate to support them. Many of the investigators feel that the possibilities of this particular form of therapy are sufficiently great to warrant almost any expense.

The Value of Breathing Exercises in Asthma

James L. Livingstone, M.D., F.R.C.P. Lond. (Physician, King's College Hospital; Assistant Physician, Hospital for Consumption and Diseases of the Chest, Brompton; and Marjorie Gillespie, M.D., Glasgow (Hague Asthma Research Scholar). (From the Asthma Clinic, King's College Hospital. In Lancet, CCXXIX:5848:705, Sept. 28, 1935.)

The remedial value of breathing exercises in asthma has been known for many years and has been practiced by the medical profession in this country and abroad. On the Continent, Dr. L. Hofbauer, of Vienna, claims excellent results from humming exercises in his book on the treatment of asthma. In this country breathing exercises have been used as an adjuvant to other forms of treatment in various physiotherapeutic departments, including those of Guy's, the Hospital for Sick Children, Great Ormond Street, and King's College Hospital.

The Aims of Breathing Exercises

During an attack, in which the bronchioles are narrowed by spasm and congestion, there is a valvular action whereby air drawn in by the strong inspiration can enter the alveoli but cannot escape. Accordingly, the asthmatic has difficulty in expiration. The chest is overdistended, air is pent up in the lungs, and there is insufficient gaseous exchange, i.e., a condition of gross functional emphysema. When the attack passes off, conditions return to normal. During an attack the breathing is of the thoracic type and the accessory muscles are fully contracted. The diaphragm is depressed to its maximum extent and is seen to be making spasmodic contractions or none at all. The more dyspnoeic the patient becomes, the more he endeavors to inspire and so overdistends his already fully inflated lungs. In chronic cases the typical permanent asthmatic deformity of the chest results—kyphosis, pigeon chest, and Harrison's sulcus. This is due to actual shortening of the fibres of the diaphragm, intercostal and accessory muscles from prolonged spasm. The chest expansion at the fourth rib is decreased to about one inch and the vital capacity is greatly diminished. For these reasons the aims of breathing exercises should be:

1. To empty the lungs by increasing the expiratory phase.
2. To re-educate the automatic diaphragmatic movements and to diminish the thoracic type of breathing.
3. To relax spasmodically contracted muscles.
4. To mobilize the ribs and chest wall and to correct kyphosis.
5. Various types of simple exercises can be devised to fulfill these requirements, and examples of such exercises are given in a booklet recently published by the Asthma Research Council (1934).

We find it best to teach patients to take a short inspiration through the nose and then to make a long expiration through the mouth, with a whistling or hissing noise; this concentrates the attention on the expiratory phase. During expiration the epigastrium must sink in to insure that the diaphragm rises in the chest. (Female patients are forbidden to wear tight corsets.)

A good deal depends on the personality of the teacher; she must gain the patient's cooperation in practicing the exercises two or three times daily for at least ten minutes over a prolonged period; she must also try to enthuse him with the benefit he is likely to obtain from the treatment. She must warn him that at first the exercises may make him worse by causing coughing and wheezing, which are produced in the majority of cases on full expiration. This loosens the mucus, which is presently coughed up, to the patient's relief. She must also persevere until the patient acquires habitual diaphragmatic breathing.

The patient is encouraged to practice the exercises, gently, when he feels an attack is imminent, in order to abort it.

Summary

In 75 cases of asthma treated for one year with expiratory breathing exercises, good clinical results were obtained in 52, improvement in 12, and no improvement in 11 cases.

The improvement seemed to depend upon the patient acquiring mobility of the chest, natural diaphragmatic breathing, and control of the diaphragm. There is also a considerable psychological factor.

The treatment requires perseverance and effort on the part of both patient and teacher over a considerable time.

A number of patients were able to abort impending attacks by these exercises; this appeared to be due to loosening and expulsion of mucus, rather than to any other factor.

This method of treatment is simple and applicable in all cases; it is sound treatment from the physiological point of view. In this series 11 out of 75 cases were unable to learn diaphragmatic control.

In spite of the fact that good results are obtained from breathing exercises alone, it is held that specific treatment should not be neglected—e.g., removal of feathers, foods, and so forth—or operation in gross nasal disease.

Book Reviews

INDIVIDUAL EXERCISES. By George T. Stafford, M. S., Director of Corrective Physical Education, University of Illinois; Harry B. DeCook, M. A., Director of Corrective Physical Education, Northwestern University; and Joseph L. Picard, M. S., Director of Physical Education, University of Arizona. Paper, pp. 111, *with* 100 *illustrations. Price* $1.00. *New York, A. S. Barnes and Co., Inc.,* 1935.

This volume is designed to give the readers basic information regarding exercises for individual needs. The exercises given are those used by the authors in the departments of physical education at three universities. Each exercise is illustrated by an excellent line drawing.

Two chapters are devoted to the exercises for specific disturbances or defects. The authors urge that the patient first place himself in the hands of his physician and secure a thorough health examination and diagnosis. This is excellent advice. They then state: "From this diagnosis, which a physician only can make, he can then select his exercise program with the aid of the sets of exercises offered in this book." This is believed to be dangerous advice to patients with some of the conditions mentioned in this book, such as high blood pressure and heart disturbances. It is believed that a physician should prescribe the amount and kind of exercise and check the patient at frequent intervals.

The doctor, the physical therapist, and the physical educator will find this book an excellent reference book for exercise prescriptions.

CHRONIC RHEUMATISM CAUSATION AND TREATMENT. By R. Fortescue Fox, M. D., F. R. C. P., R. R Met S; President of the International League Against Rheumatism, Member of the Committee on Rheumatism of the Royal College of Physicians, and J. Van Breemen, Doctor of Medicine, Honorary Secretary of the International League Against Rheumatism, Medical Director of the Central Institute for Physical Treatment in Amsterdam and of the Consulting Bureau on Rheumatic Diseases of the Dutch Society on Rheumatism. Cloth. Pp. 364, *illustrated. Price* 12s 6d. *London, J. & A. Churchill. Ltd.* 1934.

This volume is the work of two authors well qualified to present the latest European views on chronic rheumatism. Their outlines of the causation and character of the chronic rheumatic diseases give excellent reasons for their treatment. "For treatment, as at present advised, we rely to a great extent on Physical Medicine, because in our opinion, there is no branch of medical practice to which natural remedies have so great an affinity as the prevention and control of rheumatism."

Physical therapists interested in the treatment of rheumatism should read the chapters on the skin as an organ, chill, treatment-objects and methods, treatment—illustrations and consultation and treatment centers. In the chapters on treatment, special attention is given to hydrotherapy. The therapeutic pool is considered in detail. The five uses of these pools are: (1) to relieve nervous and neutral tension by the large, uniform impression and warmth upon the skin, (2) to improve circulation and increase body warmth and nutrition, (3) to restore movement, (4) to resolve deposits, and (5) to reeducate lost function. It is stated that the therapeutic pool was made the central feature of the Hydrotherapeutic Department of the Red Cross Clinic for Rheumatism in London.

ELECTROPYREXIA IN GENERAL PARALYSIS. By Leland E. Hinsie, M. D., Research Associate in Psychiatry, New York State Psychiatric Institute and Hospital; Professor of Clinical Psychiatry, College of Physicians and Surgeons, Columbia University, and Joseph R. Blalock, M. D., Senior Physician (Psychiatrist) New York State Psychiatric Institute and Hospital; Instructor in Psychiatry, College of Physicians and Surgeons, Columbia University. Cloth. Pp. 90. *Price* $1.25. *Utica. N. Y. State Hospital Press.* 1934.

This small book gives a description of the use of ultra-high frequency currents to produce hyperpyrexia for treatment of adult general paralysis. Part I is devoted to a review of the literature on electropyrexia. Part II considers the use of the radiotherm in the production of hyperpyrexia. In these cases of adult hyperpyrexia, the authors discuss the clinical data prior to treatment, the clinical results, the comparison of clinical results under different methods of treatments, observations on body weight, and laboratory results. The volume will be of interest to those using hyperpyrexia with physical agents.

NEW PATHWAYS TO CHILDREN WITH CEREBRAL PALSY. By Gladys Gage Thomas, Director of Robin Hood's Barn, a Camp School for Children with Cerebral Palsy, and Leah C. Thomas, Director of Therapeutics at Robin Hood's Barn, formerly Associate Professor of Hygiene and Physical Education, Smith College, formerly Director of Corrective Exercises under the direction of Dr. Joel E. Golthwaite and Dr. Robert B. Osgood, Boston, Massachusetts.

The authors through long years of experience in dealing with the spastic child, have an unusually keen perception of and sympathetic understanding of the problem of the spastic child. In this volume they deal in a practical way with the physical, mental and character development of the spastic. For this reason it is particularly interesting to parents. The authors stress ways and means of creating an environment beneficial to the spastic child, placing in that environment those things that will help him in his development.

They tell us about Robin Hood's Barn, a camp for spastic children. There they open up to him every avenue of learning and of activity. They also urge that every opportunity be given to him to enrich mind and character to the limits of which he is capable, and they give to him every opportunity to develop the body to the limits of physical improvement of which he is capable.

The book abounds in positive ideas and practical applications. It is full of enthusiasm and optimism. To read it will be an inspiration to all those who have to help solve the problem of adapting the spastic child to his environment. It will help the doctor, the physical therapist, the teacher and the parent.

BALANCE SKILLS IN PHYSICAL EDUCATION. By Charles LeRoy Lowman, M. D., F. A. C. S., Chief of Staff Orthopedic Hospital, Los Angeles, Calif. Pp. 42, *with illustrations. Price* $1.60 *Edward Brothers, Inc., Ann Arbor, Mich.* 1935.

In response to innumerable inquiries Dr. Lowman herein amplifies his discussion of the value of balance skills and the use of the inclined tread balance board as presented in one of his former publications *Corrective Physical Education for Groups.*

There is a brief review of the neuro-muscular factors of body balance and emphasis is placed upon the

necessity for the development of all sensory channels not only for the pathological but for the normal individual as well.

Faulty posture, an important consideration for the physical therapist as well as the teacher of physical education, is considered as a problem necessitating attention to the muscle imbalance as well as ligamentous tension. This should be recognized and dealt with early in the child's life before bad posture habits are formed and as a primary aid he offers his very simple and inexpensive piece of apparatus, the tilted balance board. It is similar to the board with which we all are familiar except that it is wider and the top, instead of being flat, is elevated in the center so that the individual stands with feet parallel and weight on the outer borders. This supinated position of the feet readjusts muscle pull and joint alignment making it easier to assume a fundamentally corrective position from which to work.

With a background of fifteen years of successful use of the board as incidental in the school physical education program, Dr. Lowman demonstrates the value of balance exercises taken in this corrective position. The board can be used in group or individual work with posture cases, in support of which are presented exercises and suggestions which have been used in the field. Contraindications for the use of the balance board in certain pathological cases are carefully presented.

Dr. Lowman's discussion should be of value to anyone interested in posture and the possibility of utilizing for its benefit the almost instinctive urge toward the development of skill in coordinative movements.

DIE PHYSIOLOGISCHEN UND PHYSIKALISCHEN GRUNDLAGEN DER HAUTTHERMOMETRIE: MIT EINEM ANHANG UBER WEITERE PHYSIOLOGISCHE TEMPERATURMESSUNGEN. Von Priv.-Doz. Dr. med. H. Pfleiderer und Dr. phil. K. Büttner, Mit einem Geleitwort von Prof. Dr. A. Schittenhelm. Paper. Price 4.80 marks. Pp. 52, with 10 illustrations. Leipzig: Johann Ambrosius Barth, 1935.

This excellent monograph evaluates the various methods available for making accurate temperature measurements of the body both externally and internally. The preface discusses the importance of the skin as a balancing organ in regulating the internal body temperature.

In the preface the author discusses the importance of the skin as an organ for balancing the internal body temperature against the environmental changes to which the skin is subjected. He further points out that the skin is the receptor for the various physical therapy procedures. He states that the skin is a mirror of the external and internal influences of the body.

In chapter one he describes the role of the skin as a good heat insulator but states that the capillary blood serves as an excellent means of dissipating excess internal heat. He also states that the larger the capillary bed the higher the skin temperature and the greater the heat loss.

In chapter two he discusses the internal influences on skin temperature such as fever, psychic excitation, work, antipyretics, alcohol, and amyl nitrate. He also goes into the part that pigment of the skin plays, the significance of oil and fat in the skin as well as the thickness of the skin.

In chapter three Pfleiderer describes his method of computing the temperature of the tunica media temperature. Chapter four discusses local skin temperature differences due to topographical differences. Chapter five is devoted to the skin temperature as a diagnostic medium in various conditions. Chapter six discusses the procedure for taking temperature measurements. Some excellent practical angles to this problem are discussed. The authors evaluate the various measuring instruments that are available for this work.

Chapter seven outlines the various methods such as mercury thermometer, electrical resistance thermometer, radiation, and the thermocouple. Each method is well evaluated.

Chapter eight gives a description of Büttner's thermocouple as used for point measurements. The resistance thermometer is also described as used for rectal, vaginal, mouth and axilla temperature.

The technic of taking skin temperatures of covered parts, outer surfaces of clothes; the taking of subcutaneous temperatures with thermocouples placed in hyperdermic needles is outlined.

Anyone wishing information on the technique of skin and other tissue temperature will find this little book quite helpful. It is especially valuable in pointing out the difficulties that can be encountered in this field and how they can be circumvented.

BEHAVIOR DEVELOPMENT IN INFANTS: A SURVEY OF THE LITERATURE ON PRENATAL AND POST-NATAL ACTIVITY, 1920-1934. *By Evelyn Dewey. Published for the Josiah Macy Jr. Foundation. Cloth. Price* $3.50. *Pp.* 321, *New York, Columbia University Press.*

In response to a common complaint that it is almost impossible for any individual to keep abreast of all the literature on a given subject, there has been a definite trend toward the publication of "reviews of the literature." This book is an example of just such a service. The author has surveyed the literature on pre-natal and post-natal activity in infants from 1920 to 1935 and has arranged the material in a very interesting and instructive manner. Behavior, as described in this text, is approached from the point of view of stimulus-response mechanisms. In the introduction this approach is clearly defined after a consideration of the Behavioristic and Gestalt theories. The material is then presented under three main headings: I, The Behavior of the Human Fetus; II, Neonatal Behavior; and III, The Behavior During Infancy.

Investigations of the behavior of the human fetus have shown that many of the early patterns of activity may be evident as early as two months. The correlation of the earliest muscle movements with embryologic studies of neural connections is particularly instructive. The reader will become acquainted with many new facts concerning the origin of reflexes and early response mechanisms.

The chapter on Neonatal Behavior deals with reactions fully developed at birth. Sleep, crying, yawning, sneezing, pupillary reflexes, deep and superficial reflexes, as well as more complicated reflexes of movement and position are discussed.

The Behavior during infancy includes the holding up of the head, sitting, crawling, creeping, assuming the erect position and walking. A discussion of the development of language is also briefly presented. The role of the special senses as developed in the infant is considered from the point of view of their significance in aiding the infant to make adjustments to the demands of the environment.

The author warns against the over-emphasis of the Gestalt or organismic concept of growth processes in view of the logical evidence presented in favor of the older reflex-arc and behavioristic theories.

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ANNOUNCEMENT

The Radiological Review & Chicago Medical Recorder, published at Quincy, Illinois, since 1924, will change its name beginning in January and become the *Radiologic Review & Mississippi Valley Medical Journal,* the official publication of the recently formed Mississippi Valley Medical Society. The editorial policies will be the same as the old Radiological Review with the addition of the publication of the papers read before the Mississippi Valley Medical Society. Dr. Harold Swanberg, the Secretary-Treasurer of the Mississippi Valley Medical Society and Editor of the old Journal, will remain as Editor. The Editorial Board of the Radiologic Review will be supplemented by an Editorial Board from the membership of the Mississippi Valley Medical Society.